Extreme Networks Consolidated Hardware Guide

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Published: December 2002
Part number: 100093-00 Rev. 03

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Preface

This preface provides an overview of this guide, describes guide conventions, and lists other publications that might be useful.

NOTE

To ensure proper operation of your Extreme Networks equipment, read this guide before you install any Extreme Networks equipment.

Introduction

This guide provides the required information to install an Extreme Networks Summit™ switch, Alpine™switch, or BlackDiamond® switch. It also contains information about site location, switch functionality, and switch operation.

This guide is intended for use by network administrators who are responsible for installing and setting up network equipment. It assumes a basic working knowledge of:

- Local Area Networks (LANs)
- Ethernet concepts
- Ethernet switching and bridging concepts
- Routing concepts
- Simple Network Management Protocol (SNMP)

See the *ExtremeWare Software User Guide* for information about configuring an Extreme Networks switch.

NOTE

If the information in the Release Notes that shipped with your switch differs from the information in this guide, follow the Release Notes.

Conventions

Table 1 and Table 2 list conventions used throughout this guide.

Table 1: Notice icons

Icon	Notice Type	Alerts you to...
	Note	Important features or instructions.
	Caution	Risk of personal injury, system damage, or loss of data.
	Warning	Risk of severe personal injury.

Table 2: Text conventions

Convention	Description
`Screen displays`	This typeface represents information as it appears on the screen, or command syntax.
Screen displays bold	This typeface represents commands that you type.
The words “enter” and “type”	When you see the word “enter” in this guide, you must type something, and then press the Return or Enter key. Do not press the Return or Enter key when an instruction simply says “type.”
[Key] names	Key names appear in text in one of two ways: • Referenced by their labels, such as “the Return key” or “the Escape key” • Written with brackets, such as [Return] or [Esc] If you must press two or more keys simultaneously, the key names are linked with a plus sign (+). Example: Press [Ctrl]+[Alt]+[Del].
Words in *italicized* type	Italics emphasize a point of information or denote new terms at the place where they are defined in the text.

Related Publications

The Extreme Networks switch documentation set includes:

- *Extreme Networks Consolidated Hardware Guide* (this guide)
- *ExtremeWare Software User Guide*
- *ExtremeWare Quick Reference Guide*
- *ExtremeWare Software Command Reference Guide*
- *ExtremeWare Release Notes*

Documentation for Extreme Networks products is available from the Extreme Networks website at the following location:

http://www.extremenetworks.com/services/documentation/

You can select and download the following Extreme Networks documentation from the Documentation section of the Services page:

- Release Notes
- Software
- Hardware
- Reports
- White Papers
- Troubleshooting Tools
- Preventative Maintenance
- Instructional Videos
- Archives

You can also purchase Extreme Networks documentation from the Extreme Networks website.

About This Guide

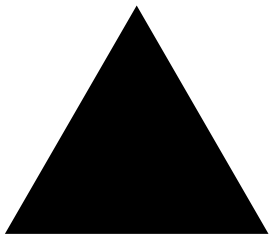
This guide describes how to prepare your site and how to install, maintain, and operate your Extreme Networks switch. It contains information on features that are common to all switches, as well as switch-specific features. This guide contains seven parts:

- Common Features—Describes features that are shared by the Extreme Networks family of switches. This section describes software images, full-duplex support, management ports, mini-GBIC and GBIC modules and their installation.
- Site Planning—Describes how to evaluate, plan, and determine the location of your Extreme Networks switch.
- Summit Switch—Describes the features that are specific to the Summit switch. This section provides an overview of the Summit switch, information about model types, summary of features, and installation guidelines.
- Alpine Switch—Describes the features that are specific to the Alpine switch. This section provides an overview of the Alpine switch, information about model types, a summary of features, and installation guidelines.
- BlackDiamond Switch—Describes the features that are specific to the BlackDiamond switch. This section provides an overview of the BlackDiamond switch, information about model types, a summary of features, and installation guidelines.
- Switch Operation—Describes how to power on any Extreme Networks switch, verify the switch installation, connect equipment to the console port, and log in to the switch for the first time.
- Appendixes—Includes information about safety requirements and technical specifications.

How To Use This Guide

Each chapter of this guide contains information on how to successfully operate your Extreme Networks switch. The Summit-, Alpine-, and BlackDiamond-specific chapters contain information that is applicable to that family of switch only. All other chapters are applicable to any Extreme Networks switch. For switch-specific information, be sure to read the applicable switch-specific chapter. For example, if you have a BlackDiamond switch and you need to remove and replace an I/O module, see "Removing I/O Modules" in Chapter 16 for details about how to remove and replace an I/O module in a BlackDiamond chassis. For items applicable to any Extreme Networks switch, make sure you read the appropriate chapter. For example, to learn how to prepare your site for installing your Extreme Networks equipment, see Chapter 2, "Site Preparation."

The appendices describe switch safety issues, switch specifications, and module specifications. The Safety Information appendix describes important safety issues such as power, power cables, and fuses. The Technical Specifications appendix is organized according to the family of switch: Summit, Alpine, and BlackDiamond, and describes switch specifications such as physical dimensions, weight, certifications, and power supply parameters. Information that is common to all switches is described at the end of the appendix. The Module Technical Specifications appendix is organized according to the family of switch and modules available for that switch, and describes module specifications such as physical dimensions, weight, and standards.



Part 1
Common Features

1 Summary of Common Switch Features

This chapter describes the features that are shared in common by the Extreme Networks family of switches. The following topics are described in greater detail:

- Software Images on page 27
- Full-Duplex Support on page 28
- Management Ports on page 28
- Mini-GBIC Type and Hardware/Software Support on page 28
- GBIC Type and Hardware/Software Support on page 32

Software Images

When you receive a new Extreme Networks switch, be aware that an the ExtremeWare™ software image has been preinstalled at the factory. To verify the software image you are running on your switch, use the `show version` command. The `show version` command displays the hardware and software versions currently running on the switch. To ensure that you have the latest software image, go to the Extreme Networks support website at:

http://www.extremenetworks.com/support/scopus.asp

If your switch is running ExtremeWare version 6.2 or later, the Power LED activity is different from previous versions of ExtremeWare. All other LED activity is the same. See Table 3 for more information about the Power LED activity on switches running ExtremeWare version 6.2 or later.

Table 3: Power LED activity for switches running ExtremeWare version 6.2 or later

LED	Color	Indicates
Power LED	Green	The indicated power supply unit (PSU) is powered up.
	Amber	A PSU is installed, but not connected to power.
	Off	The PSU is not receiving power or no PSU is present.

NOTE

If the information in the Release Notes that shipped with your switch differs from the information in this guide, follow the Release Notes.

Full-Duplex Support

Extreme Networks switches provide full-duplex support for all ports. This means that frames can be transmitted and received simultaneously, which, in effect, doubles the bandwidth that is available on a link. Most ports on an Extreme Networks switch autonegotiate for half-duplex or full-duplex operation. Gigabit Ethernet and 100BASE-FX ports operate in full-duplex mode only in accordance with technical standards.

Management Ports

The 10/100BASE-TX Ethernet management port allows you to communicate directly to the CPU of the switch. You can plug an Ethernet cable directly from your laptop into the management port. This provides you with direct access into the switch and allows you to view and locally manage the switch configurations.

Do not assign an in-band IP address to the management port VLAN. The management port VLAN is an out-of-band VLAN, so if it is assigned an in-band IP address (an address where the source and destination are in the same subnet), the switch will treat it as a normal VLAN and attempt to route traffic through it.

The management port is located on the following Extreme Networks devices:

- Summit5i—The management port is located on the back side of the switch
- Summit7i—The management port is located on the front side of the switch
- Alpine—Switch Management Module (SMMi) for the Alpine series switch
- BlackDiamond—Management Switch Fabric Module (MSM64i) for the BlackDiamond series switch

Extreme Networks does not recommend that you use the management port to route traffic to any front panel port on the switch. The management port is designed for switch management purposes.

Mini-GBIC Type and Hardware/Software Support

The Summit24e3 and Summit48si switches support the small form pluggable (SFP) GBIC, also known as the mini-GBIC. The switch identifies the type of mini-GBIC that is installed and verifies that the mini-GBIC is an Extreme Networks-certified mini-GBIC.

Mini-GBIC Types and Specifications

There are two types of mini-GBIC interfaces:

- SX mini-GBIC, which conforms to the 1000BASE-SX standard
- LX mini-GBIC, which conforms to the 1000BASE-LX standard

Use only Extreme Networks-certified mini-GBICs, available from Extreme Networks, into the mini-GBIC port in the switch.

Table 4 describes the specifications for the SX mini-GBIC interface, and Table 5 describes the specifications for the LX mini-GBIC interface.

Table 4: SX mini-GBIC specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-9.5 dBm		-4 dBm
Center wavelength	830 nm	850 nm	860 nm
Receiver			
Optical input power sensitivity	-21 dBm		
Optical input power maximum			-4 dBm
Operating wavelength	830 nm		860 nm
General			
Total system budget			11.5 dBm

Total optical system budget for the SX mini-GBIC is 11.5 dBm. Extreme Networks recommends that 3 dBm of the total budget be reserved for losses induced by cable splices/connectors and operating margin. While 8.5 dBm remains available for cable induced attenuation, the 1000BASE-SX standard specifies supported distances of 275 meters over 62.5 micron multimode fiber and 550 meters over 50 micron multimode fiber. There is no minimum attenuation or minimum cable length restriction.

Table 5: LX mini-GBIC specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-9.5 dBm		-3 dBm
Center wavelength	1275 nm	1310 nm	1355 nm
Receiver			
Optical input power sensitivity	-23 dBm		
Optical input power maximum			-3 dBm
Operating wavelength	1270 nm		1355 nm
General			
Total system budget			13.5 dBm

Total optical system budget for the LX mini-GBIC is 13.5 dBm. Measure cable plant losses with a 1310 nm light source and verify this to be within budget. When calculating the maximum distance attainable using optical cable with a specified loss per kilometer (for example 0.25 dB/km) Extreme Networks recommends that 3 dBm of the total budget be reserved for losses induced by cable splices/connectors and operating margin. Thus, 10.5 dBm remains available for cable induced attenuation. There is no minimum system budget or minimum cable length restriction because the maximum receive power is the same as the maximum transmit power. There is no minimum attenuation or minimum cable length restriction.

Safety Information

Before you begin the process of installing or replacing a mini-GBIC, read the safety information in this section.

CAUTION

Mini-GBICs can emit invisible laser radiation. Avoid direct eye exposure to beam.

Mini-GBICs are class 1 laser devices, and they operate at 3.3 V. Use only Extreme Networks-certified mini-GBIC devices.

If you see an amber blinking mini-GBIC port status LED after you install a mini-GBIC into the Summit24e3 or Summit48si switch, this means the mini-GBIC is not certified by Extreme Networks. To correct this problem, install an Extreme Networks-certified mini-GBIC, available from Extreme Networks, into the port in the switch.

Preparing to Install or Replace a Mini-GBIC

To ensure proper installation, complete the following tasks before inserting the mini-GBIC:

1. Disable the port that is needed to install or replace the mini-GBIC.
2. Inspect and clean the fiber tips, coupler, and connectors.
3. Prepare and clean an external attenuator, if needed.
4. Do not stretch the fiber.
5. Make sure the bend radius of the fiber is not less than 2 inches (5.08 cm).

In addition to the previously described tasks, Extreme Networks recommends the following when installing or replacing mini-GBICs on an active network:

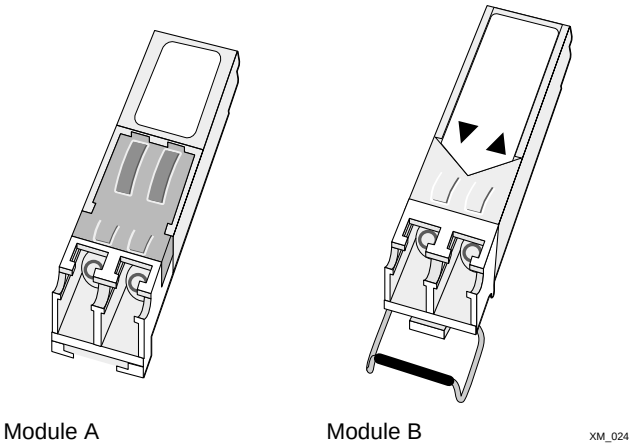
1. Use the same type of mini-GBIC at each end of the link.
2. Connect one end of the link to the Tx port. Without an attenuator, measure the total loss from the Tx port to the other site of the link. For example, the total loss must not exceed the total optical system budget.

After you complete these described tasks, you are ready to install or replace a mini-GBIC.

Installing and Removing a Mini-GBIC

You can add and remove mini-GBICs from your Summit24e3 or Summit48si switch without powering off the system. Figure 1 shows the two types of mini-GBIC connectors.

Figure 1: Mini-GBIC modules



Mini-GBICs are Class 1 laser devices. Use only Extreme-approved devices.

NOTE

Remove the LC fiber-optic connector from the mini-GBIC prior to removing the mini-GBIC from the switch.

CAUTION

Mini-GBICs can emit invisible laser radiation. Avoid direct eye exposure to beam.

If you see an amber blinking mini-GBIC port status LED after you install a mini-GBIC into the Summit24e3 or Summit48si switch, this means the mini-GBIC is not certified by Extreme Networks. To correct this problem, install an Extreme Networks-certified mini-GBIC, available from Extreme Networks, into the port in the switch.

To remove the mini-GBIC connector labeled “Module A,” gently depress and hold the black plastic tab at the bottom of the connector and pull the mini-GBIC out of the port on the switch.

To remove the mini-GBIC connector labeled “Module B,” gently lift down on the front handle and pull the mini-GBIC out of the port on the switch.

To insert a mini-GBIC connector:

1. Holding the mini-GBIC by its sides, insert the mini-GBIC into the port on the switch.
2. Slide the mini-GBIC into the port, until you hear it click. If the mini-GBIC has a handle, push up on the handle to secure the SX mini-GBIC.

GBIC Type and Hardware/Software Support

Most Extreme Networks switches support two types of GBICs: the Parallel ID GBIC and the Serial ID GBIC. The switch can identify the media type for the GBIC that is installed. Initial ExtremeWare software versions do not support Serial ID GBICs. If Serial ID GBICs are installed in a switch with an initial software release, the switch will not bring up the link on GBIC ports.

GBIC Media Types and Distances

Table 6 describes the media types and associated maximum distances for each GBIC type.

Table 6: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

GBIC Specifications

Table 7 through Table 13 describe the specifications for each GBIC type.

Table 7: 1000BASE-SX specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-9.5 dBm		-4 dBm
Center wavelength	830 nm	850 nm	860 nm

Table 7: 1000BASE-SX specifications (continued)

Parameter	Minimum	Typical	Maximum
Receiver			
Optical input power sensitivity	-17 dBm		
Optical input power maximum			0 dBm
Operating wavelength	830 nm		860 nm

Table 8: 100BASE-LX specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-11 dBm		-3 dBm
Center wavelength	1270 nm	1310 nm	1355 nm
Receiver			
Optical input power sensitivity	-19 dBm		
Optical input power maximum			-3 dBm
Operating wavelength	1270 nm		1355 nm

Table 9: ZX GBIC specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-4 dBm	-3 dBm	-1 dBm
Center wavelength	1540 nm	1550 nm	1570 nm
Receiver			
Optical input power sensitivity	-23.5 dBm		
Optical input power maximum			-1 dBm
Operating wavelength	1540 nm	1550 nm	1570 nm

Table 10: ZX GBIC Rev 03 specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-2 dBm	0 dBm	2 dBm
Center wavelength	1540 nm	1550 nm	1570 nm
Receiver			
Optical input power sensitivity	-23 dBm		
Optical input power maximum			-1 dBm
Operating wavelength	1540 nm	1550 nm	1570 nm

Identifying ZX GBIC Rev 03 Modules

To identify the type of ZX GBIC module you have, look at the label on the top of the ZX GBIC module. If you see one of the following on the label, you have a ZX GBIC Rev 03 module:

- DVA-1203 sticker near the top of the label that covers the Extreme Networks logo
- ZX GBIC (1203) text near the top of the label
- ZX GBIC Rev 03 text near the center of the label

Table 11: LX70 GBIC specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	0 dBm	3 dBm	5.2 dBm
Center wavelength	1540 nm	1550 nm	1570 nm
Receiver			
Optical input power sensitivity	-22 dBm		
Optical input power maximum			-3 dBm
Operating wavelength	1270 nm		1570 nm

Table 12: LX100 GBIC specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	1 dBm	3 dBm	5 dBm
Center wavelength	1546 nm	1551 nm	1557 nm
Receiver			
Optical input power sensitivity	-29 dBm		
Optical input power maximum			-7 dBm
Operating wavelength	1546 nm	1551 nm	1557 nm

Requirements for the LX100 GBIC

This section describes the requirements for the LX100 GBIC. Read the information in this section before you install an LX100 GBIC.

The Summit24e2 switch does not support the LX100 GBIC. Do not install an LX100 GBIC into the Summit24e2 switch.

If you have an Alpine 3800 series switch populated with a GM-4Xi module, do one of the following:

- Install a maximum of three LX100 GBICs per GM-4Xi module; the fourth GBIC slot must remain empty
- Install two or less LX100 GBICs per GM-4Xi module and leave the remaining GBIC slots empty
- Install two or less LX100 GBICs per GM-4Xi module and install any combination of the following GBICs into the empty slots:
  - 1000BASE-SX

— 1000BASE-LX

— ZX GBIC

— ZX Rev 03

— LX70

— UTP GBIC

To ensure correct operation of the LX100 GBIC, make sure that you run ExtremeWare 6.1.9 or later on your switch.

Table 13: UTP GBIC specifications

Media Type	Bit Error Rate (Errors per Second)	Data Rate	Min Distance (Meters)	Max Distance (Meters)
Category 5 UTP cable	10^{-12}	1 Gbps	2	80

Requirements for the UTP GBIC

The UTP GBIC operates in full-duplex mode only. The UTP GBIC does not operate in 10/100 Mbps mode, and it does not support autonegotiation of link speed.

You need to disable autonegotiation on the ports that use the UTP GBIC and manually configure the port speed to 1000 Mbps.

The following example disables autonegotiation, configures a port speed of 1000 Mbps, and specifies full-duplex mode for port 4 on a stand-alone switch:

```
config ports 4 auto off speed 1000 duplex full
```

The following example disables autonegotiation, configures a port speed of 1000 Mbps, and specifies full-duplex mode for port 1 on a G8Xi module located in slot 1 of a modular switch:

```
config ports 1:1 auto off speed 1000 duplex full
```

The UTP GBIC is supported on “i” series products only.

Long Range GBIC System Budgets

Measure cable plant losses with a 1550 nm light source and verify this to be within budget. When calculating the maximum distance attainable, using optical cable with a specified loss per kilometer (for example, 0.25 db/km), Extreme Networks recommends that 3 dB of the total budget be reserved for losses induced by cable splices, connectors, and operating margin. Figure 2 shows the total optical system budget between long range GBICs.

NOTE

The fiber loss budget plus all other penalties must not exceed the total optical system budget.

Figure 2: Total optical system budgets for long range GBICs

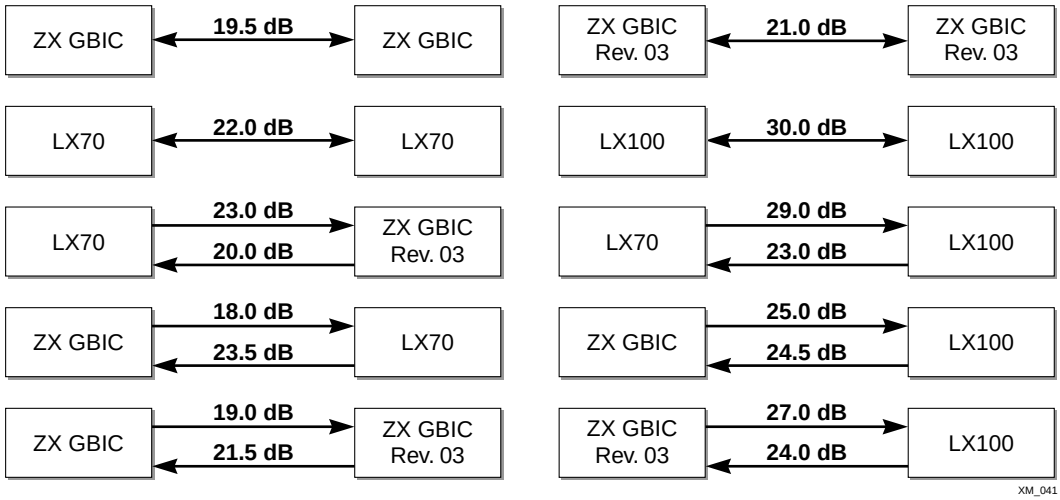


Table 14 lists the minimum attenuations that are required by each long range GBIC to prevent saturation of the receiver.

Table 14: Minimum attenuation requirements

		Receivers			
	GBIC Type	**LX70**	**ZX (prior to Rev 03)**	**ZX Rev 03**	**LX100**
Transceivers	**LX70**	10 dB	10 dB	10 dB	11 dB
	ZX (prior to Rev 03)	0 dB	0 dB	0 dB	8 dB
	ZX Rev 03	8 dB	8 dB	8 dB	9 dB
	LX100	11 dB	11 dB	11 dB	12 dB

Safety Information

Before you install or replace a GBIC, read the safety information in this section.

CAUTION

GBICs can emit invisible laser radiation. Avoid direct eye exposure to beam.

GBICs are class 1 laser devices, and they operate at 5 V. Use only Extreme-approved devices.

Remove the SC fiber-optic or the RJ-45 connector from the GBIC prior to removing the GBIC from the I/O module or the switch.

Preparing to Install or Replace a GBIC

This section describes the preparation steps that you must perform before inserting and securing a GBIC.

CAUTION

GBICs can emit invisible laser radiation. Avoid direct eye exposure to beam.

To ensure proper installation, complete the following tasks before inserting the GBIC:

1. Inspect and clean the fiber tips, coupler, and connectors.
2. Prepare and clean an external attenuator, if needed.
3. Calculate the link budget.
4. Do not stretch the fiber.
5. Make sure the bend radius of the fiber is not less than 2 inches.

In addition to the previously described tasks, Extreme Networks recommends the following when installing or replacing GBICs on an active network:

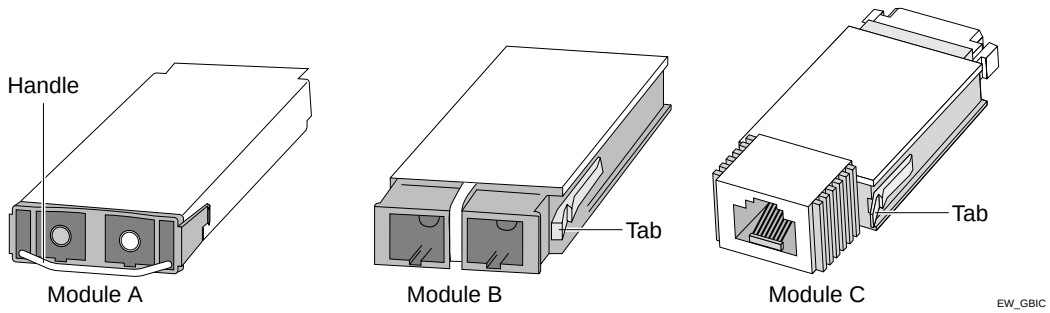
1. Use the same type of GBIC at each end of the link.
2. Connect one end of the link to the Tx port. Without an attenuator, measure the total loss from the Tx port to the other site of the link. For example, the total loss must not exceed the total optical system budget listed in Figure 2.
3. Use dispersion shifted fiber whenever possible. This provides superior performance in the 1550 nm range.

After you complete all of these described tasks, you are ready to install or replace a GBIC.

Installing or Replacing a GBIC

You can add and remove GBICs from your Extreme Networks switch without powering off the system. Figure 3 shows the three types of GBIC connectors.

Figure 3: GBIC modules



GBICs are a Class 1 laser device. Use only Extreme-approved devices.

NOTE

Remove the SC fiber-optic or the RJ-45 connector from the GBIC prior to removing the GBIC from the I/O module or the switch.

CAUTION

GBICs can emit invisible laser radiation. Avoid direct eye exposure to beam.

To remove the GBIC connector labeled “Module A,” lift up on the front handle and pull the GBIC out of the slot.

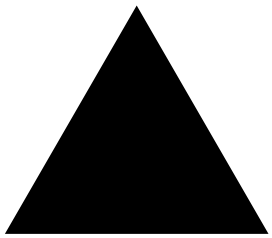
To remove the GBIC connector labeled “Module B” or “Module C,” gently squeeze the sides to release it, and pull the GBIC out of the slot.

To insert a GBIC connector:

1 Holding the GBIC by its sides, insert the GBIC into the slot on the I/O module or the switch.

2 Slide the GBIC into the slot, until you hear it click.

3 If the GBIC has a handle, push down on the handle to secure the GBIC.



Part 2
Site Planning

2 Site Preparation

This chapter describes how to prepare your site for installing Extreme Networks equipment. It contains information on environmental and cabling requirements, power requirements, and building and electrical code organizations.

This chapter includes these sections:

- Planning Your Site on page 42
- Meeting Site Requirements on page 42
- Evaluating and Meeting Cable Requirements on page 53
- Meeting Power Requirements on page 58
- Applicable Industry Standards on page 61

The requirements described in this chapter are intended for the system administrator, network equipment technician, or network manager who is responsible for installing and managing the network hardware. It assumes a working knowledge of local area network (LAN) operations, and a familiarity with communications protocols that are used on interconnected LANs. Installation, maintenance, and removal of a switch, chassis, or its components must be done by qualified service personnel only.

Qualified service personnel have had appropriate technical training and experience that is necessary to be aware of the hazards to which they are exposed when performing a task and of measures to minimize the danger to themselves or other people.

By carefully planning your site, you can maximize the performance of your existing network and ensure that it is ready to migrate to future networking technologies.

To learn more about safety issues and to ensure safety compliance, see Appendix A.

WARNING!

Read the safety information in Appendix A thoroughly before installing your Extreme Networks switch. Failure to follow this safety information can lead to personal injury or damage to the equipment.

Planning Your Site

To install your equipment successfully, you should plan your site carefully. The site planning process has three major steps:

Step 1: Meeting Site Requirements

Your physical installation site must meet several requirements for a safe and successful installation:

- Building and electrical code requirements
- Environmental, safety, and thermal requirements for the equipment you plan to install
- Distribution rack requirements

Step 2: Evaluating and Meeting Cable Requirements

After examining your physical site and ensuring all environment requirements are met, you should evaluate and compare your existing cable plant with the requirements of the Extreme Networks equipment to determine if you need to install new cables (or cabling).

Step 3: Meeting Power Requirements

To run your equipment safely, you must meet the specific power requirements for the Extreme Networks equipment that you plan to install.

NOTE

Review and follow the safety information before you install your equipment.

Meeting Site Requirements

This section addresses the various requirements to consider when preparing your installation site, including:

- Operating Environment Requirements
- Rack Specifications and Recommendations

Operating Environment Requirements

You need to verify that your site meets all environmental and safety requirements.

Virtually all areas of the United States are regulated by building codes and standards. During the early planning stages of installing or modifying your LAN, it is important that you develop a thorough understanding of the regulations that pertain to your location and industry.

Building and Electrical Codes

Building and electrical codes vary depending on your location. Comply with all code specifications when planning your site and installing cable. The following sections are provided as a resource to obtain additional information.

Three major building codes are:

- Uniform Building Code—produced by the International Conference of Building Officials (ICBO); 5360 South Workman Mill Road; Whittier, California 90601 USA. www.icbo.org
- BOCA Basic Building Code—produced by the Building Officials and Code Administrators (BOCA) International, Inc.; 4051 West Flossmoor Road; Country Club Hills, Illinois 60478 USA. www.bocai.org
- Standard Building Code (SBC)—produced by the Southern Building Code Congress International, Inc.; 900 Montclair Road; Birmingham, Alabama 35213 USA. www.sbcci.org

Five authorities on electrical codes are:

- National Electrical Code (NEC) Classification (USA only)—a recognized authority on safe electrical wiring. Federal, state, and local governments use NEC standards to establish their own laws, ordinances, and codes on wiring specifications. The NEC classification is published by the National Fire Protection Association (NFPA). The address is NFPA; 1 Batterymarch Park; Quincy, Massachusetts 02269 USA. www.nfpa.org
- Underwriters' Laboratory (UL) (USA only)—an independent research and testing laboratory. UL evaluates the performance and capability of electrical wiring and equipment to determine whether they meet certain safety standards when properly used. Acceptance is usually indicated by the words "UL Approved" or "UL Listed." The address is UL; 333 Pfingsten Road; Northbrook, Illinois 60062-2096 USA. www.ul.com
- National Electrical Manufacturing Association (NEMA) (USA only)—an organization of electrical product manufacturers. Members develop consensus standards for cables, wiring, and electrical components. The address is NEMA; 2101 L Street N.W.; Washington, D.C. 20037 USA. www.nema.org
- Electronics Industry Association (EIA)—a trade association that develops technical standards, disseminates marketing data, and maintains contact with government agencies in matters relating to the electronics industry. The address is EIA; 2001 Eye Street N.W.; Washington, D.C. 20006 USA. www.eia.org
- Federal Communications Commission (FCC)—a commission that regulates all interstate and foreign electrical communication systems that originate in the United States according to the Communications Act of 1934. The FCC regulates all U.S. telephone and cable systems. The address is FCC; 1919 M Street N.W.; Washington, D.C. 20554 USA.

Wiring Closet Considerations

You should consider the following recommendations for your wiring closet:

- Ensure that your system is easily accessible for installation and service. See "Rack Specifications and Recommendations" on page 51 for specific recommendations.
- Use appropriate AC power for your switch, as described in Table 15.

Table 15: AC power requirements

Switch Type	Country	Requirements
Alpine/Summit	North America	13 A service receptacle, NEMA 5-15 for 110/220 VAC power supplies.
Alpine/Summit	United Kingdom	10 A service receptacle, BS 1363 for 110/220 VAC power supplies.
Alpine/Summit	International	10 A service receptacle, CEE 7/7 for 110/220 VAC power supplies.
Alpine/Summit	Australia	10 A service receptacle, AS 3112 for 110/220 VAC power supplies.
Alpine/Summit	Japan	15 A service receptacle, JIS 8303 for 110/220 VAC power supplies.

Table 15: AC power requirements (continued)

Switch Type	Country	Requirements
BlackDiamond	North America	20 A service receptacle, NEMA L6-20 (locking) for BlackDiamond 110 VAC power supplies.
BlackDiamond	North America	20 A service receptacle, NEMA L6-20 (locking) for BlackDiamond 220 VAC power supplies.
BlackDiamond	International	16 A/20 A service receptacle, IEC 60309 for BlackDiamond 220 VAC power supplies.
BlackDiamond	North America	20 A service receptacle, NEMA 5-20 (non-locking) for BlackDiamond 110 VAC power supplies.
BlackDimamond	North America	20 A service receptacle, NEMA 6-20 (non-locking) for BlackDiamond 220 VAC power supplies.
BlackDiamond	International	16 A service receptacle, CEE 7/7 for BlackDiamond 220 VAC power supplies.
BlackDiamond	Australia	15 A service receptacle, 036 for BlackDiamond 220 VAC power supplies.

- Use appropriate DC power for your switch, as described in Table 16.

Table 16: DC power requirements

Switch Type	Country	Requirements
Alpine	International	• Use 30 A at -40 VDC (or equivalent power between -40 and -70 VDC) for Alpine DC power supplies. • For Alpine DC power and ground cables, use 8 AWG, high strand-count copper wire cable (Alpine 3808), 10 AWG, high strand-count copper wire cable (Alpine 3804), or 14 AWG, high strand-count copper wire cable (Alpine 3802).
BlackDiamond	International	• Use 55 A service for BlackDiamond DC power supplies. • For BlackDiamond DC power cables, use 4 AWG, high strand-count copper wire cable.

- Use a vinyl floor covering in your wiring closet. (Concrete floors accumulate dust, and carpets can cause static electricity.)
- Prevent unauthorized access to wiring closets by providing door locks. Install the equipment in a secured, enclosed, and restricted-access area, ensuring that only qualified service personnel have access to the equipment.
- Provide adequate overhead lighting for easy maintenance.
- Ensure that each wiring closet has a suitable ground. All distribution racks and equipment installed in the closet should be grounded.
- Ensure that all system environmental requirements are met, such as ambient temperature and humidity.

NOTE

Extreme Networks recommends that you consult an electrical contractor for commercial building and wiring specifications.

Temperature. Extreme Networks equipment generates a significant amount of heat. It is essential that you provide a temperature-controlled environment for both performance and safety.

Install the equipment only in a temperature- and humidity-controlled indoor area that is free of airborne materials that can conduct electricity. Too much humidity can cause a fire. Too little humidity can produce electrical shock and fire.

The following are some general thermal recommendations for your wiring closet:

- Ensure that the ventilation in the wiring closet is adequate to maintain a temperature below 104° F (40° C).
- Install a reliable air conditioning and ventilation system.
- Keep the ventilation in the wiring closet running during nonbusiness hours; otherwise, the equipment can overheat.
- Maintain ambient operating temperature: 32° to 104° F (0° to 40° C)
- Maintain storage Temperature: -40° to 158° F (-40° to 70° C)

NOTE

Like all electrical equipment, product lifetimes degrade with increased temperature. If possible, temperatures should be kept at approximately 78° F (25° C) or lower.

BlackDiamond 6816 Spacing Requirements. Due to chassis-to-chassis heating, Extreme Networks recommends placing no more than three BlackDiamond 6816 chassis next to each other.

The following are some general recommendations for installing your BlackDiamond 6816 chassis:

- A minimum of 17.32 inches (44 cm) between each set of three BlackDiamond 6816 chassis.

  Or

- Place front-back cooled equipment, such as a BlackDiamond 6808 chassis, between each set of three BlackDiamond 6816 chassis.

  Or

- Place patch panels, which are used to patch cables together, between each set of three BlackDiamond 6816 chassis. A patch panel does not require any power and does not generate any heat.

NOTE

Up to five adjacent BlackDiamond 6816 chassis will continue to function without safety concerns. However, product lifetime may degrade with continued exposure to high temperatures in close proximity and long term reliability may be compromised.

Airflow Requirements. To ensure proper airflow through an Extreme Networks switch, refer to the following recommendations when you are installing your switch:

- The Summit family of switches require 3 inches (7.62 cm) on both the left and right sides of the switch (5 inches (12.7 cm) recommended) for proper airflow.
- The Alpine 3800 series chassis require 3 inches (7.62 cm) on both the left and right sides of the switch (5 inches (12.7 cm) recommended) for proper airflow.
- The BlackDiamond 6816 and 6804 chassis require 3 inches (7.62 cm) around the entire chassis—front, rear, and sides—(5 inches (12.7 cm) recommended) for proper airflow.

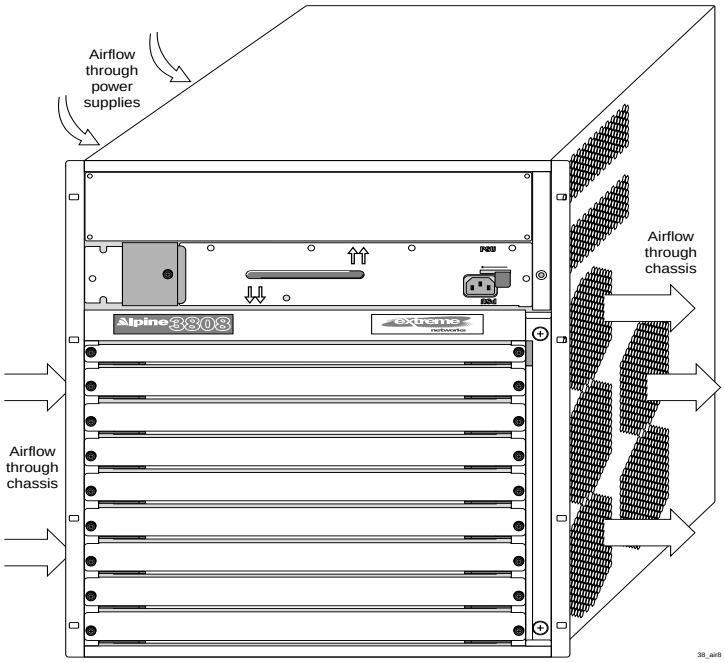
- The BlackDiamond 6808 chassis requires 3 inches (7.62 cm) around both the front and rear of the chassis (5 inches (12.7 cm) recommended) for proper airflow.

The airflow of the Summit family of switches moves from the left side of the switch to the right side of the switch, or from the right side of the switch to the left side of the switch depending on the model.

The airflow of the Alpine 3808 moves through the power supplies and is independent of the airflow through the chassis as shown in Figure 4. For example, if the power supply fans fail, the airflow through the module area of the chassis will not cool down the power supplies.

- Airflow for cooling power supplies enters the top of the chassis and moves left to right as you face the chassis.
- Airflow for cooling modules moves left to right as you face the chassis.

Figure 4: Airflow through the Alpine 3808 chassis



The airflow of the Alpine 3804 and Alpine 3802 moves from the left side of the chassis to the right side of the chassis as shown in Figure 5 and Figure 6.

- Airflow for cooling power supplies moves left to right as you face the chassis.
- Airflow for cooling modules moves left to right as you face the chassis.

Figure 5: Airflow through the Alpine 3804 chassis

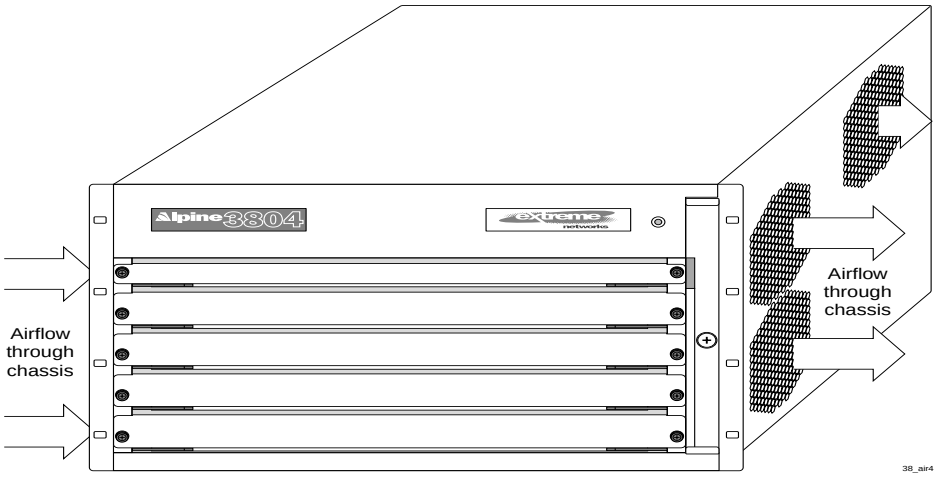
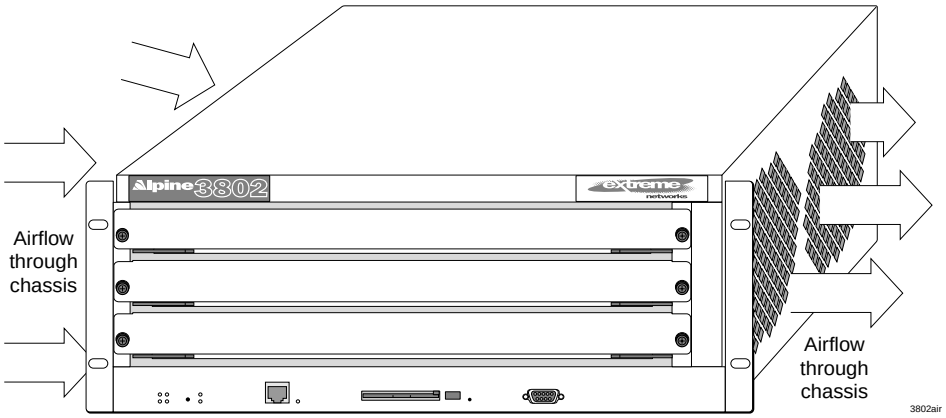


Figure 6: Airflow through the Alpine 3802 chassis



The airflow of the BlackDiamond 6800 series chassis moves through the power supplies and is independent of the airflow through the modules as shown in Figure 7, Figure 8, and Figure 9. For example, if the power supply fans fail, the airflow through the module area of the chassis will not cool down the power supplies.

- Airflow for cooling power supplies moves front to back as you face the chassis.
- Airflow for cooling modules moves left to right as you face the chassis.

Figure 7: Airflow through the BlackDiamond 6816 chassis

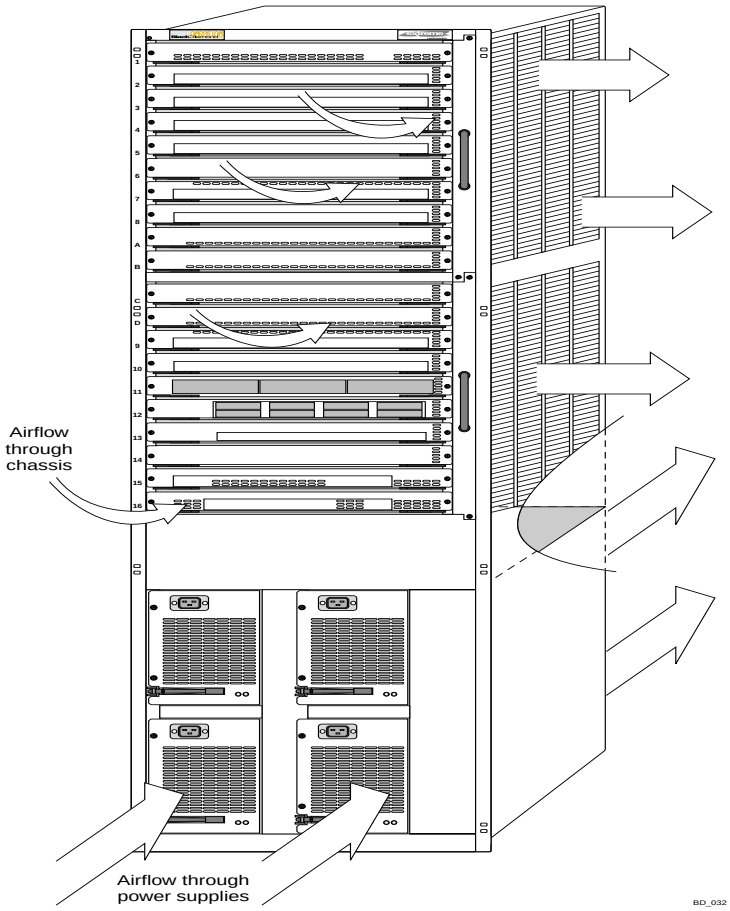


Figure 8: Airflow through the BlackDiamond 6808 chassis

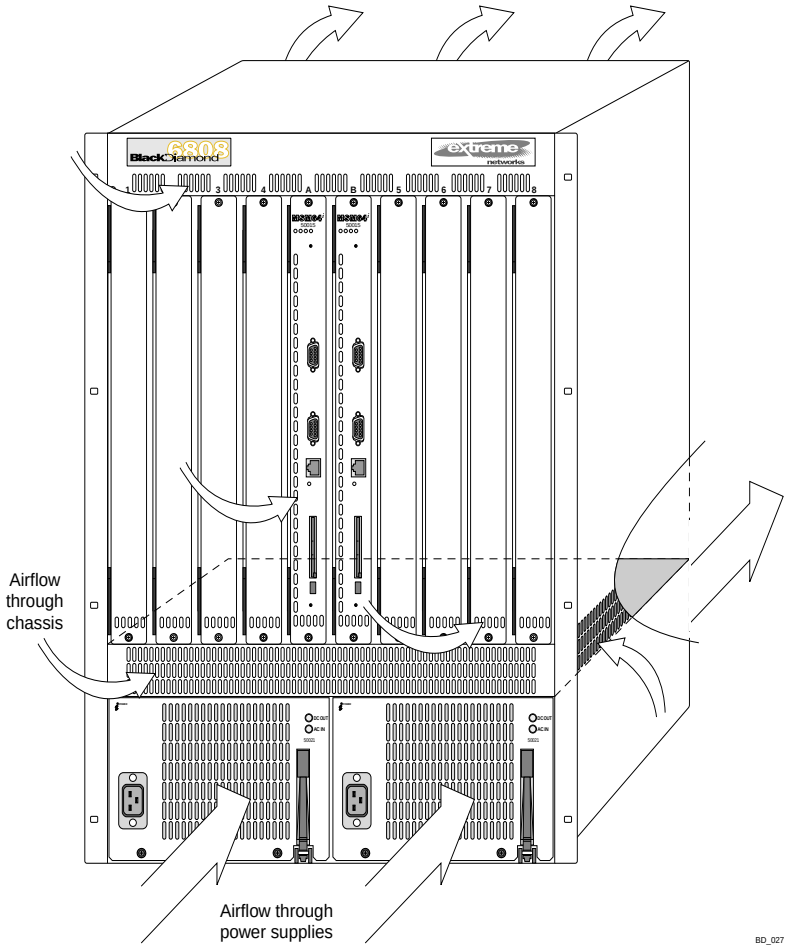
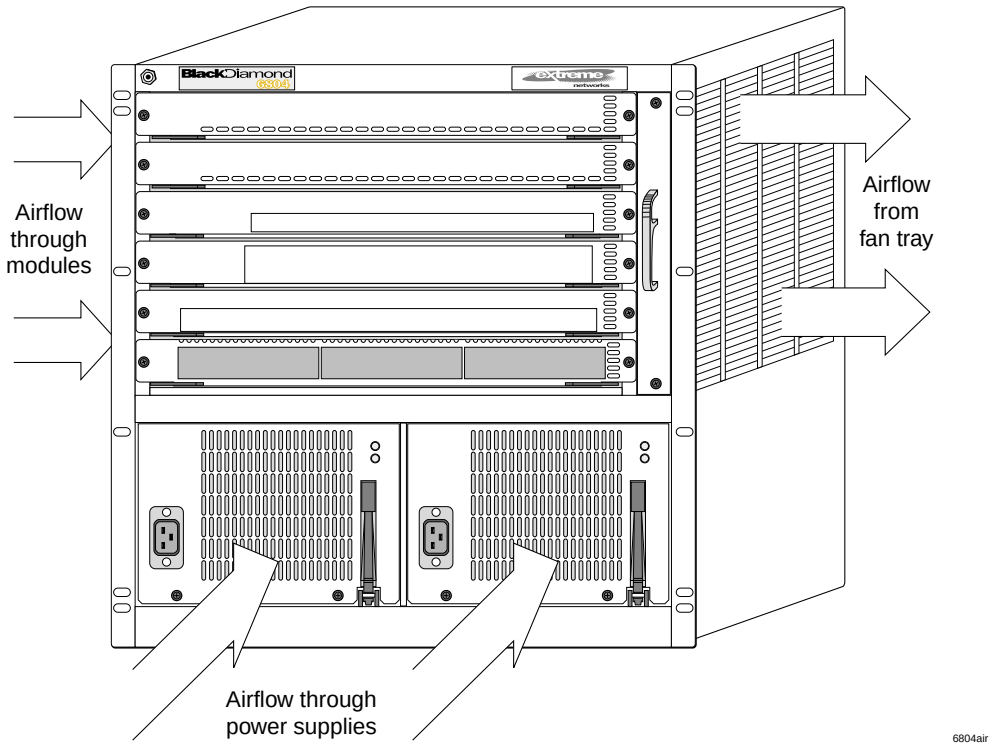


Figure 9: Airflow through the BlackDiamond 6804 chassis



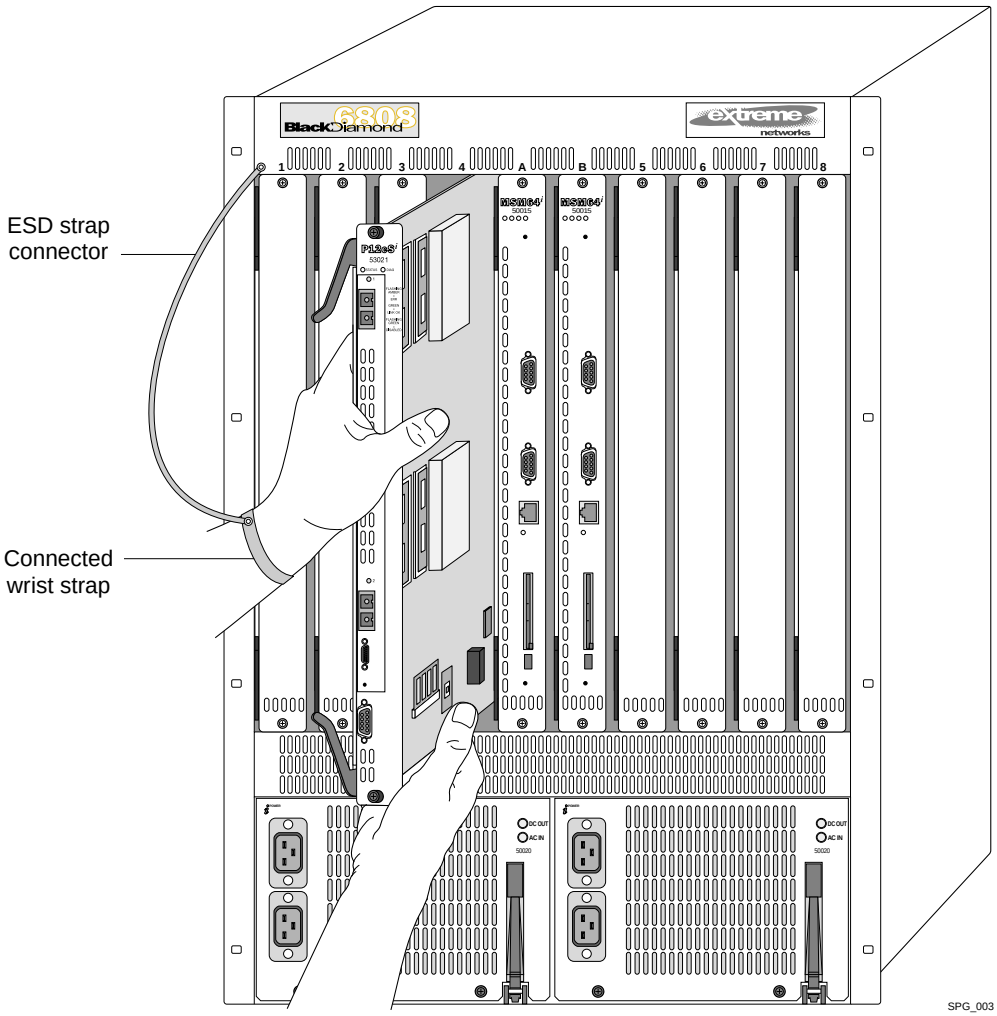
Humidity. Operating humidity should be kept between 10 and 95% relative humidity (noncondensing).

Electrostatic Discharge (ESD)

Your system must be protected from static electricity. Take the following measures to ensure optimum system performance:

- Keep relative humidity at 50 to 70%.
- Remove materials that can cause electrostatic generation (such as synthetic resins) from the wiring closet. Check the appropriateness of floor mats and flooring.
- Connect conductors (metals, etc.) to ground, using dedicated grounding lines.
- Use electrostatically safe equipment and the ESD straps that are provided with your equipment. All Alpine and BlackDiamond switches come with ESD wrist strap connectors and wrist straps as shown in Figure 10.

Figure 10: Ensure that you use an ESD wrist strap when handling switch components



Rack Specifications and Recommendations

Racks should conform to conventional standards. In the United States, use EIA Standard RS-310C: Racks, Panels, and Associated Equipment. In countries other than the United States, use IEC Standard 297. In addition, verify that your rack meets the basic mechanical and space requirements that are described in this section.

Mechanical Recommendations for the Rack

Use distribution racks that meet the following mechanical recommendations:

- Use an open style, 19-inch (48.26 cm) rack to facilitate easy maintenance and to provide proper ventilation.
- The rack should use the universal mounting rail hole pattern that is identified in IEC Standard 297.
- The mounting holes should be flush with the rails to accommodate the chassis.
- Use a rack made of steel or aluminum.

- Install equipment into the lower half of the rack first to avoid making the rack top-heavy.
- The rack should support approximately 600 pounds (272 kilograms).

Protective Grounding for the Rack

Use a rack grounding kit and a ground conductor that is carried back to earth or to another suitable building ground.

All Extreme Networks switches are designed with mounting brackets that provide solid metal-to-metal connection to the rack. If you do not use equipment racks, you can attach wiring terminals directly to the mounting brackets for appropriate grounding. Alpine products have grounding terminals that are mounted on the back of the chassis.

At minimum, follow these guidelines:

- Ground equipment racks to earth ground.
  - CAD weld appropriate wire terminals to building I-beams or earth ground rods.
  - Use #4 copper wire.
  - Drill and tap wire terminals to equipment racks.
  - Position the earth ground as close to the equipment rack as possible to maintain the shortest wiring distance possible.
  - Properly test the quality of the earth ground.

NOTE

Because building codes vary worldwide, Extreme Networks strongly recommends that you consult an electrical contractor to ensure proper equipment grounding is in place for your specific installation.

- Ground DC power supplies to earth ground by using the grounding terminals provided.

Space Requirements for the Rack

Provide enough space in front of and behind the switch so that you can service it easily. Allow a minimum of 48 inches (122 cm) in front of the rack and 24 inches (61 cm) behind the rack. When using a relay rack, provide a minimum of 24 inches (61 cm) of space behind the mounted equipment. Extra room on each side is optional.

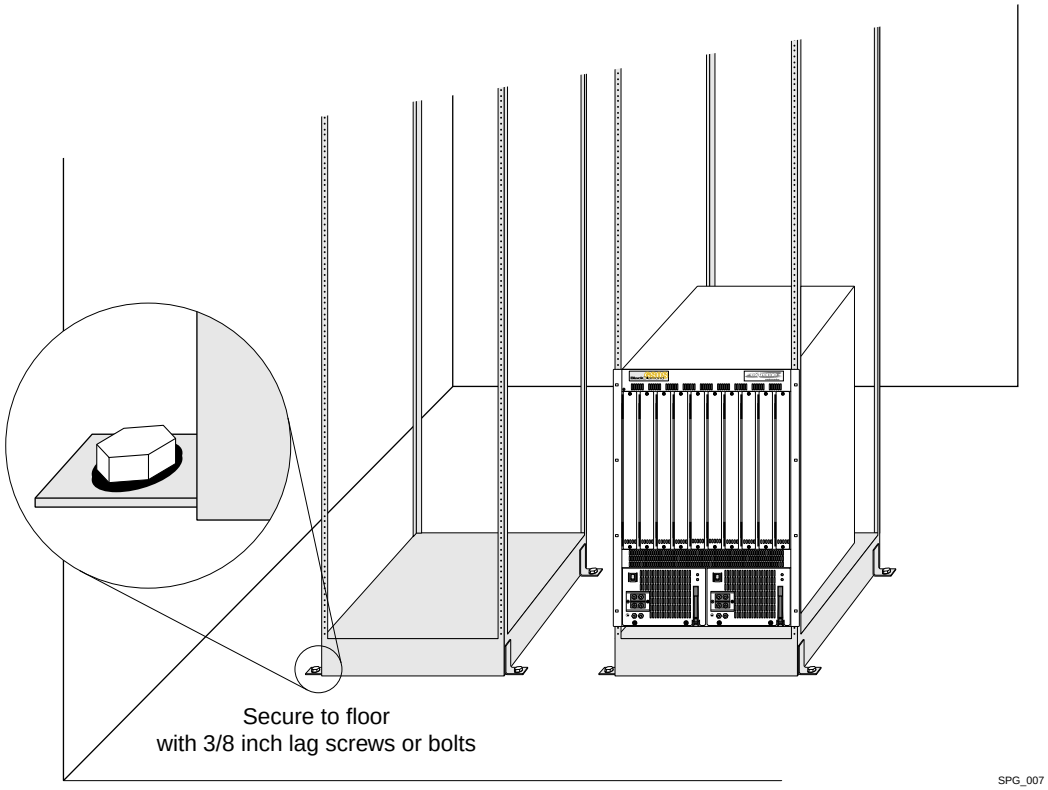
NOTE

Install your equipment rack near an easily accessible power outlet. When you need to disconnect the power cable from your switch, remove it first from the power source and then from the switch.

Securing the Rack

The rack should be attached to the wiring closet floor with 3/8 inch (9.5 mm) lag screws or equivalent hardware. The floor under the rack should be level within 3/16 inch
(5 mm). Use a floor-leveling cement compound if necessary or bolt the racks to the floor as shown in Figure 11.

Figure 11: Properly secured rack



Brace open distribution racks if the channel thickness is less than 1/4 inch (6.4 mm).

Evaluating and Meeting Cable Requirements

This section addresses requirements for the that cable you should use when installing your network equipment. It includes:

- Cabling Standards
- Cable Labeling and Record Keeping
- Installing Cable
- RJ-45 Connector Jackets
- Radio Frequency Interference

Cabling Standards

We recommend using the BICSI (Building Industry Consulting Service International) RCDD (Registered Communications Distribution Designer), which is globally recognized as a standard in site planning and cabling. For information, go to http://www.bicsi.org

Cable Labeling and Record Keeping

A reliable cable labeling system is essential when planning and installing a network. Maintaining accurate records helps you to:

- Relocate devices easily.
- Make changes quickly.
- Isolate faults in the distribution system.
- Locate the opposite end of any cable.
- Know the types of network devices that your cabling infrastructure can support.

Consider the following recommendations when setting up a cable labeling system suitable for your installation:

- Identify cables by securely attaching a label to all cable ends.
- Assign a unique block of sequential numbers to the group of cables that run between each pair of wiring closets.
- Assign a unique identification number to each distribution rack.
- Identify all wiring closets by labeling the front panel of your Extreme Networks equipment and other hardware.
- Keep accurate and current cable identification records.
- Post records near each distribution rack. Include the following cable drop information: the cable source, destination, and jumper location.

Installing Cable

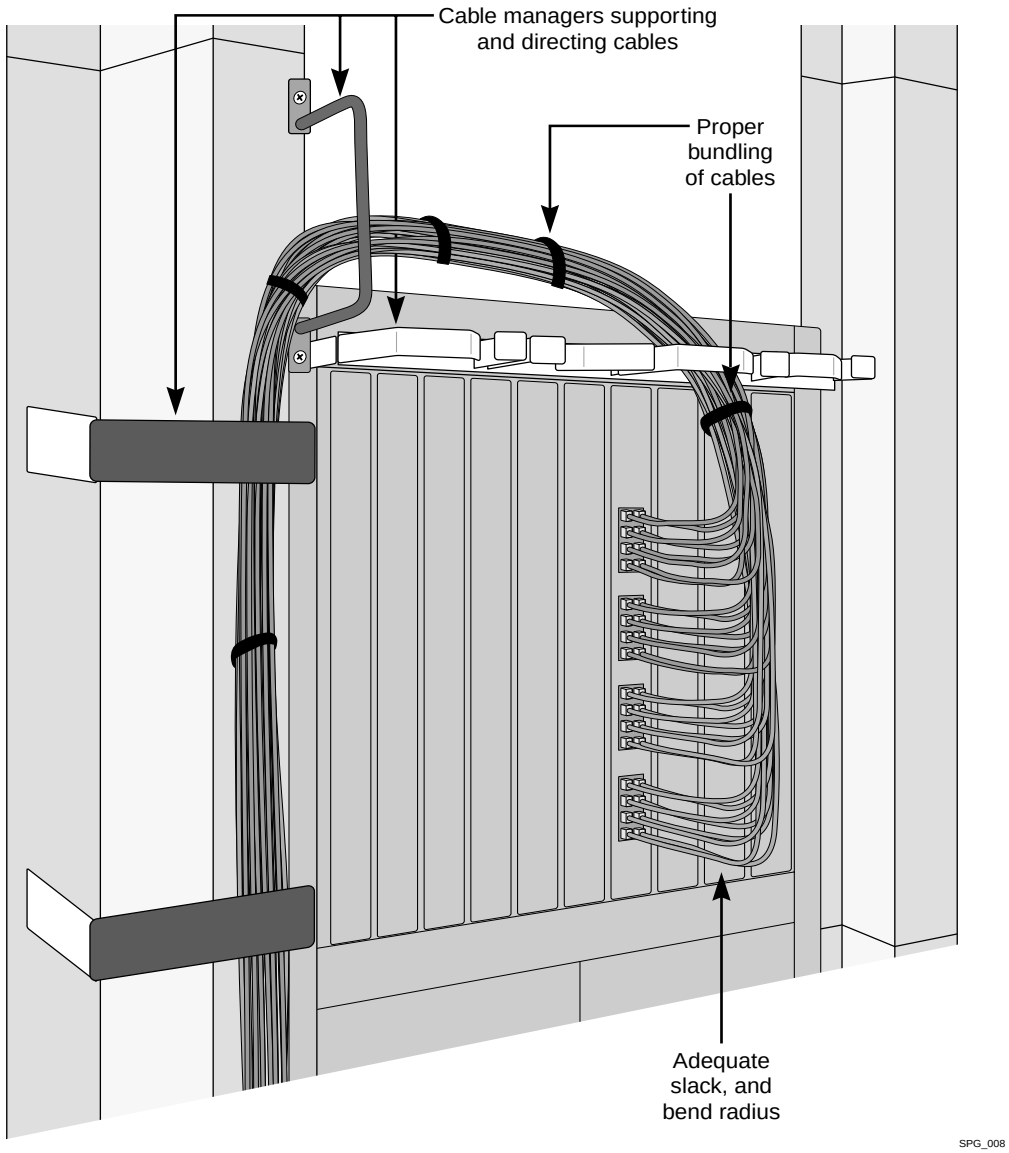
Consider the following recommendations when you connect cable to your network equipment:

- Examine cable for cuts, bends, and nicks.
- Support cable using a cable manager that is mounted above connectors to avoid unnecessary weight on the cable bundles.
- Use cable managers to route cable bundles to the left and right of the network equipment to maximize accessibility to the connectors.
- Provide enough slack—approximately 2 to 3 inches (5.08-7.62 cm)— to provide proper strain relief as shown in Figure 12.
- Bundle cable using velcro straps to avoid injuring cables.
- If you build your own cable, ensure that cable is properly crimped.
- When installing a patch panel using twisted pair wiring, untwist no more than 1 inch (2.54 cm) of the cable to avoid RF interference.
- When required for safety and fire rating requirements, use plenum-rated cable. See your local building codes for determining when it is appropriate to use plenum-rated cable, or refer to IEC standard 850.
- Keep all ports and connectors free of dust.

NOTE

Unshielded twisted pair (UTP) cable can build up ESD charges when being pulled into a new installation. Before installing category 5 UTP cables, discharge ESD from the cable by plugging it into a port on a switch or any network device that is not powered on.

Figure 12: Properly installed and bundled cable



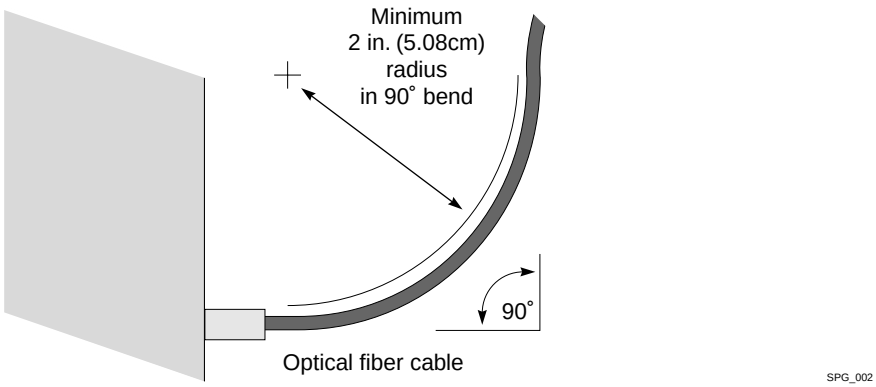
Fiber Optic Cable

Fiber optic cable must be treated gently during installation. Every cable has a minimum bend radius, for example, and fibers will be damaged if the cables are bent too sharply. It is also important not to stretch the cable during installation. We recommend that the bend radius for fiber optic cable equals 2-inch (5.08 cm) minimum for each 90 degree turn as shown in Figure 13.

NOTE

Kinks and sharp bends can destroy or impair the cable's ability to convey light pulses accurately from one end of the cable to the other. Use care in dressing the optical-fiber cables: provide satisfactory strain relief to support the cable and maintain an adequate bend radius at all cable turns, particularly where the cable connects to the I/O module.

Figure 13: Bend radius for fiber optic cable



Cable Distances

Table 17 shows cable media types and maximum distances that support reliable transmission in accordance with international standards except where noted.

Table 17: Media types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
1000BASE-SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
1000BASE-LX (1300 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
1000BASE-LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
100BASE-FX (1300 nm optical window)	50/125 µm multimode fiber	400	2000
	50/125 µm multimode fiber	500	2000
	62.5/125 µm multimode fiber	400	2000
	62.5/125 µm multimode fiber	500	2000

Table 17: Media types and maximum distances (continued)

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
1000BASE-T	Category 5 and higher UTP cable	–	100
100BASE-TX	Category 5 and higher UTP cable	–	100
10BASE-T	Category 3 and higher UTP cable	–	100

* Proprietary to Extreme Networks. Connections between two Extreme Networks 1000BASE-LX interfaces that use 10/125 µm single-mode fiber can use a maximum distance of 10,000 meters.

RJ-45 Connector Jackets

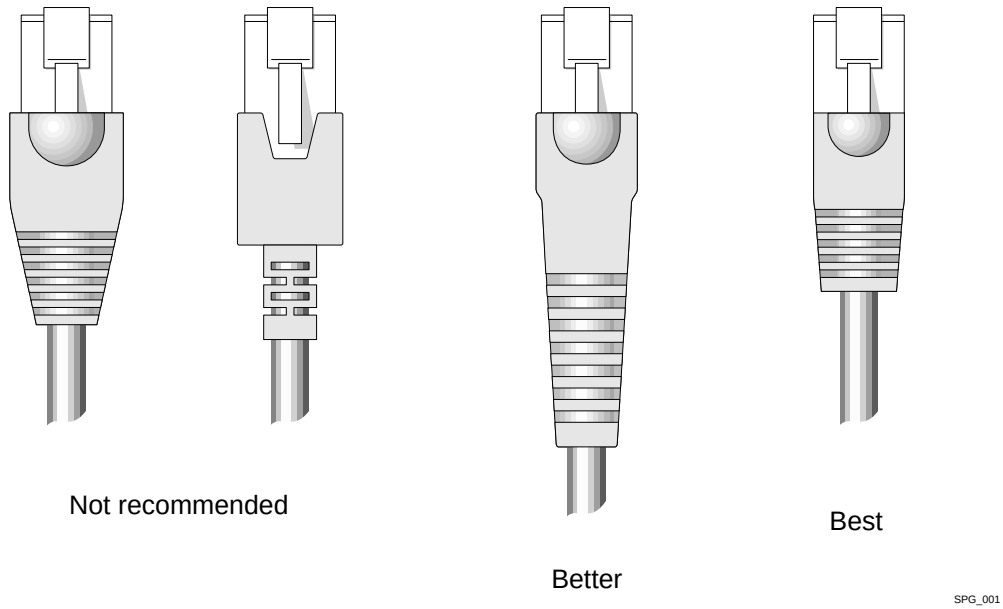
Use RJ-45 cable with connector jackets that are flush with the connector or that have connectors with a no-snag feature.

Using cable with jackets that are wider than the connectors can cause:

- Connectors that are not properly aligned with the port.
- Crowded cable installation, which can cause connectors to pop out of the port.

Figure 14 shows examples of connector jacket types that are not recommended as well as those that are recommended.

Figure 14: RJ-45 connector jacket types



Radio Frequency Interference

If you use unshielded twisted pair (UTP) cabling in an installation, take precautions to avoid radio frequency (RF) interference. RF interference can cause degradation of signal quality, and, in an Ethernet

network environment, can cause excessive collisions, loss of link status, or other physical layer problems that can lead to poor performance or loss of communication.

To prevent RF interference, avoid the following devices or situations:

- Attaching UTP cable to AC power cables
- Routing UTP cable near antennas, such as a Ham radio antenna
- Routing UTP cable near equipment that could exhibit RF interference, such as:
  - ARC welding equipment
  - Electrical motors that contain coils
  - Air conditioner units
  - Electrical transformers

In areas or applications where these situations cannot be avoided, use fiber optic cabling or shielded twisted pair cabling (STP).

NOTE

Because harmonics can appear on the neutral line of a typical three-phase power circuit, Extreme Networks recommends using a harmonics meter in new installations.

Making Network Interface Cable Connections

Use the appropriate type of cable to connect the ports of your switch to another switch or router.

Working carefully, one port at a time, follow these steps:

1. Verify that you have identified the correct cable for the port.
2. Use an alcohol wipe or other appropriate cleaning agent to clean the cable connectors; make sure they are free of dust, oil, and other contaminants.
3. If you are using optical-fiber cable, align the transmit (Tx) and receive (Rx) connectors with the correct corresponding connectors on the switch or the I/O module.

   On the ATM and PoS modules, the transmit (Tx) connector on each port is the top connector.
4. Press the cable connectors into their mating connectors on the switch or I/O module until the cable connector is firmly seated.
5. Repeat steps 1 through 4 for the remaining cables on this or other switches or I/O modules.
6. Dress and secure the cable bundle to provide appropriate strain relief and protection against bends and kinks.

Meeting Power Requirements

This section discusses power requirements, including:

- Power Supply Requirements
- AC Power Cable Requirements
- Uninterruptable Power Supply Requirements

For more information about the power specifications of the Extreme Networks family of switches, see Appendix B, “Switch Technical Specifications” on page 297.

Power Supply Requirements

Adhere to the following requirements in order to operate your Extreme Networks equipment safely:

- Ensure that your equipment is placed in an area that accommodates the power consumption and component heat dissipation specifications.
- Ensure that your power supply meets the site power, AC power, or DC power requirements of the network equipment.
- Ensure that DC connections are made by an on-site electrician.

NOTE

For power specifications for Extreme Networks products, see the Extreme Networks website at http://www.extremenetworks.com.

- When connecting power to installed equipment, avoid connecting through an extension cord or power strip.
- If your switch includes more than one power supply, connect each power supply to different, independent power sources. If a power source fails, it will only affect the switch power supply to which it is connected. If all switch power supplies are connected to a single power source, the entire switch is vulnerable to a power source failure.

AC Power Cable Requirements

Use an AC power cable appropriate for your country. Check your local electrical codes and regulatory agencies for power cable requirements. The countries listed in Table 18 have the following additional requirements:

Table 18: AC power cable requirements

Country	Requirements
USA and Canada	• The cable set must be UL-approved and CSA-certified. • The minimum specification for the flexible cable is No. 18 AWG (1.5 mm ^{2}), Type SVT or SJT, 3-conductor. • The cable set must have a rated current capacity of at least the amount rated for each specific product. • The attachment plug must be an Earth-grounding type with a NEMA 5-15P (10 A, 125 V) configuration.
Denmark	The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011.
Argentina	The supply plug must comply with Argentinian standards.

NOTE

When using dual power supplies, make sure that each AC power supply attaches to an independent power source.

Replacing the Power Cable

If the power cable plug is unsuitable and must be replaced, connect the power supply wires for the switch according to the following scheme:

- Brown wire to the Live (Line) plug terminal, which may be marked with the letter “L” or colored red.
- Blue wire to the Neutral plug terminal, which may be marked with the letter “N” or colored black.
- Yellow / Green wire to the Ground plug terminal, which may be marked with the letter “E” (the Earth symbol) or colored yellow / green.

Uninterruptable Power Supply Requirements

An uninterruptible power supply (UPS) is a device that sits between a power supply (such as a wall outlet) and a device (such as a switch) to prevent outages, sags, surges, and bad harmonics from adversely affecting the performance of the device.

UPS Features

A UPS traditionally can perform the following functions:

- Absorb relatively small power surges.
- Smooth out noisy power sources.
- Continue to provide power to equipment during line sags.
- Provide power for some time after a blackout has occurred.

In addition, some UPS or UPS plus software combinations provide the following functions:

- Automatic shutdown of equipment during long power outages.
- Monitoring and logging of power supply status.
- Display the voltage (current draw) of the equipment.
- Restart equipment after a long power outage.
- Display the voltage currently on the line.
- Provide alarms on certain error conditions.
- Provide short circuit protection.

Selecting a UPS

To determine UPS requirements for your switch, ask these questions:

- What are the amperage requirements?
- What is the longest potential time period that the UPS would be required to supply backup power?
- Where will the UPS be installed?
- What is the maximum transition time that your installation will allow?

NOTE

Extreme Networks recommends that you use a UPS that provides online protection.

Calculating Amperage Requirements

To determine the size of UPS that you need, use the following procedure:

1. To find VA (Volt-Amps), locate the voltage and amperage requirements for each piece of equipment. These numbers are usually located on a sticker on the back or bottom of your equipment. Then multiply the numbers together to get VA:

   VA = Volts x Amperes

2. Add the VA from each piece of equipment together to find the total VA requirement.

   To determine the minimum amperage requirements for your UPS, we recommend that you add 30% to the total.

UPS Transition Time

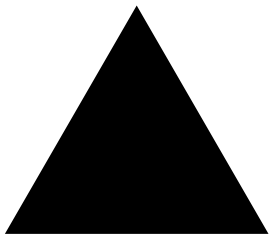
Transition time is the time that is necessary for the UPS to transfer from utility power to full-load battery power. For Extreme Networks products, a transition time of less than 20 milliseconds is required for optimum performance.

Applicable Industry Standards

For more information, see the following ANSI/TIA/EIA standards:

- ANSI/TIA/EIA-568-A—discusses the six subsystems of a structured cabling system.
- ANSI/TIA/EIA-569-A—discusses design considerations.
- ANSI/TIA/EIA-606—discusses cabling system administration.
- ANSI/TIA/EIA-607—discusses commercial building grounding and bonding requirements.

You can access these standards at **http://www.ansi.org/** or **http://www.tiaonline.org/**.



Part 3
Summit Switch

3 Summit Switch Overview

This chapter describes:

- Summit Switch Models on page 65
- Summary of Features on page 65
- Memory Requirements on page 68
- Following Safety Information on page 69

Summit Switch Models

The following models comprise the Summit family of switches:

- Summit1i
- Summit5i
- Summit7i
- Summit48i
- Suumit48si
- Summit4
- Summit4/FX
- Summit24
- Summit48
- Summit24e2
- Summit24e3
- SummitPx1

Summary of Features

This section describes the features of the Summit family of switches. If the information in the release notes differs from the information in this guide, follow the release notes. For more information about configuring the switch, refer to the *ExtremeWare Software User Guide* and *The ExtremeWare Command Reference Guide*.

Summit "*i*" series and non-"*i*" series switches

- Virtual local area networks (VLANs), including support for IEEE 802.1Q and IEEE 802.1p
- VLAN aggregation
- Spanning Tree Protocol (STP) (IEEE 802.1D) with multiple STP domains
- Policy-Based Quality of Service (PB-QoS)
- Wire-speed Internet Protocol (IP) routing
- IP multinetting
- DHCP/BOOTP relay
- Extreme Standby Router Protocol (ESRP)
- Routing Information Protocol (RIP) version 1 and RIP version 2
- Open Shortest Path First (OSPF) routing protocol
- Border Gateway Protocol (BGP) version 4
- IPX routing, including RIP and Service Advertisement Protocol (SAP)
- Wire-speed IP multicast routing
- Diffserv
- Access-policy support for routing protocols
- Access list support for packet filtering
- IGMP snooping
- Distance Vector Multicast Routing Protocol (DVMRP)
- Protocol Independent Multicast-Dense Mode (PIM-DM)
- Protocol Independent Multicast-Sparse Mode (PIM-SM)
- Wire-speed IPX, IPX/RIP, and IPX/SAP
- Server Load Balancing (SLB)
- RADIUS client and per-command authentication
- TACACS+
- Console command-line interface (CLI) connection
- Telnet CLI connection
- SSH2 connection
- ExtremeWare™ Vista™ Web-based management interface
- Simple Network Management Protocol (SNMP)
- Remote Monitoring (RMON)

Summit24e2

- VLANs, including support for IEEE 802.1Q and IEEE 802.1p
- STP (IEEE 802.1D)
- Broadcast and Multicast storm filtering
- Port mirroring
- Port trunking

- IGMP
- Menu-driven console interface
- SNMP
- Password-enabled

Summit24e3

- VLANs, including support for IEEE 802.1Q and IEEE 802.1p
- STP (IEEE 802.1D)
- Quality of Service (QoS), including support for IEEE 802.1p, MAC QoS, and four hardware queues
- Wire-speed IP routing
- DHCP/BOOTP relay
- ESRP-aware
- RIP version 1 and RIP version 2
- IGMP snooping
- RADIUS client and per-command authentication
- TACACS+
- CLI connection
- Telnet CLI connection
- SSH2 connection
- SNMP
- RMON

SummitPx1

- Wire-speed server load balancing
- Multiple server selection algorithms
- Client IP history
- Cookie detection and tracking
- Persistence
- 1,000,000 simultaneous layer 7 sessions
- 3,000,000 simultaneous layer 4 sessions
- 2,000,000 aggregate connections
- 8,000,000 client IP addresses, cookies, and SSL sessions
- 64,000 real servers
- 64,000 virtual servers

Memory Requirements

Your "*i*" series Summit switch must have 128MB of DRAM in order to support the features in ExtremeWare version 6.0 or later. This is not a requirement for Summit24 or Summit48 switch models. If you have a Summit24 or Summit48 switch, it must have 32MB of DRAM to support the features in ExtremeWare version 4.0.

To determine the memory size in your switch, use the following command:

```
show memory
```

For Summit switches running ExtremeWare 4.0 or later, the switch indicates the total DRAM size in megabytes as part of the output. For Summit switches running ExtremeWare releases prior to 4.0, you must calculate the memory by taking the sum of the bytes listed under `current free` and adding to it the bytes listed under `current alloc`. If the sum is greater than 16,000,000, there is no need to upgrade the memory on the switch. If this is not the case, please contact your supplier.

Port Connections

Summit switches use a combination of the following types of ports:

- 1000BASE-SX ports using 850 nm duplex SC connectors
- 1000BASE-LX ports using 1300 nm duplex SC connectors
- 1000BASE-LX ports using 1300 nm duplex LC connectors
- 1000BASE-SX ports using MT-RJ connectors
- 1000BASE-LX ports using MT-RJ connectors
- Modular 1000BASE-SX and 1000BASE-LX using Mini-Gigabit Interface Connectors (mini-GBICs)
- Modular 1000BASE-SX, 1000BASE-LX, 1000BASE-ZX, LX100[1], and UTP[2] using Gigabit Interface Connectors (GBICs)
- 10BASE-T/100BASE-TX ports using RJ-45 connectors
- 100BASE-FX ports using 1300 nm duplex SC connectors
- 100BASE-TX/1000BASE-T ports using RJ-45 connectors

1. The Summit24e2 switch does not support the LX100 GBIC.
2. The UTP GBIC is supported on "*i*" series switches only.

Table 19 describes port configurations available on the different Summit switch models.

Table 19: Port configurations on all Summit switch models

Ethernet Ports							
Switch Model	**1000BASE-SX**	**1000BASE-LX**	**100/1000 BASE-T**	**GBIC**	**Redundant GBIC**	**10BASE-T/ 100BASE-TX**	**100BASE-FX**
Summit1i SX	6			2			
Summit1i TX			6	2			
Summit5i SX	12			4			
Summit5i LX		12		4			
Summit5i TX			12	4			
Summit7i SX	28			4			
Summit7i TX			28	4			
Summit48i				2	2	48	
Summit48si				2		48	
Summit4	6					16	
Summit4/FX	6						16
Summit24				1	1	24	
Summit48				2	2	48	
Summit24e2				2		24	
Summit24e2 TX			2			24	
Summit24e3				2		24	
SummitPx1				1			

Following Safety Information

WARNING!

Read the safety information in Appendix A thoroughly before installing your Extreme Networks switch. Failure to follow this safety information can lead to personal injury or damage to the equipment.

- All service to components of a Summit series switch should be performed by trained service personnel only. Service personnel are persons having appropriate technical training and experience necessary to be aware of the hazards to which they are exposed in performing a task and of measures to minimize the danger to themselves or other persons.
- Some devices, such as GBICs, contain fiber optic ports. To protect your eyes, you should never look at the fiber optic ports while they are on, or look directly at the fiber cable ends when they are on.

4 Summit Switch Models

This chapter describes:

- Switch Models on page 71
- Front and rear views of the Summit switch models
- LEDs on the Summit switch models

Switch Models

The following models comprise the Summit family of switches:

- Summit1i on page 71
- Summit5i on page 75
- Summit7i on page 78
- Summit48i on page 82
- Summit48si on page 85
- Summit4 on page 90
- Summit4/FX on page 91
- Summit24 on page 92
- Summit48 on page 94
- Summit24e2 on page 97
- Summit24e3 on page 100
- SummitPx1 on page 103

Summit1i Switch Front View

As shown in Figure 15 and Figure 16, the Summit1i switch is 2U in height and is available in two port configurations:

- Six autosensing 100BASE-TX/1000BASE-T ports with RJ-45 connectors and two 1000BASE-X ports with SC connectors
- Six 1000BASE-SX ports with MT-RJ connectors and two 1000BASE-X ports with SC connectors

Figure 15: Front view of the Summit1i switch with 100BASE-TX/1000BASE-T ports

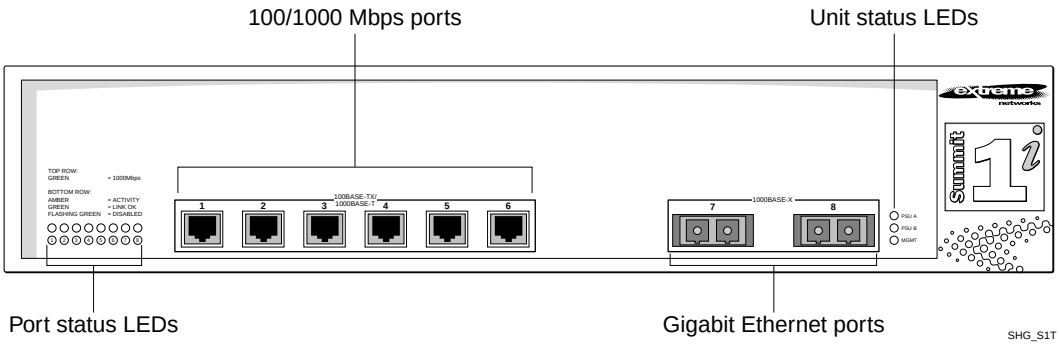
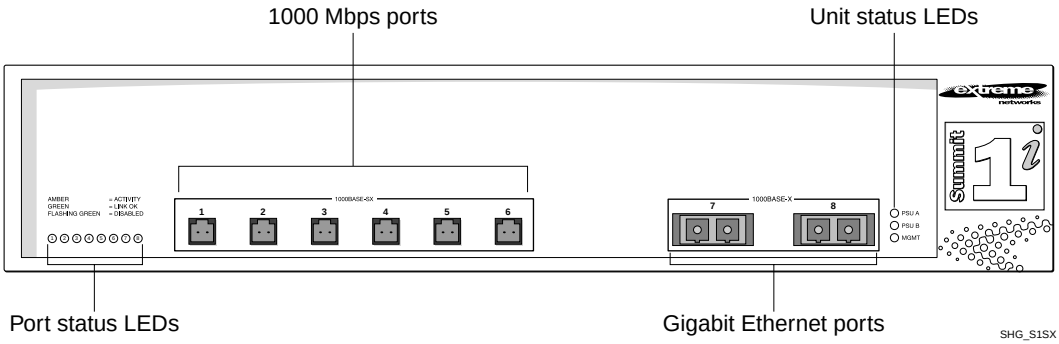


Figure 16: Front view of the Summit1i switch with 1000BASE-SX ports



GBIC Ports

Both Summit1i switch models provide two unpopulated GBIC ports with SC connectors. You can use the following GBICs in the Summit1i switch:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100
- UTP GBIC

GBIC Media Types and Distances

Table 20 describes the media types and associated maximum distances for each GBIC type.

Table 20: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see “GBIC Specifications” on page 32.

LEDs

Both Summiti1 models have the following LEDs:

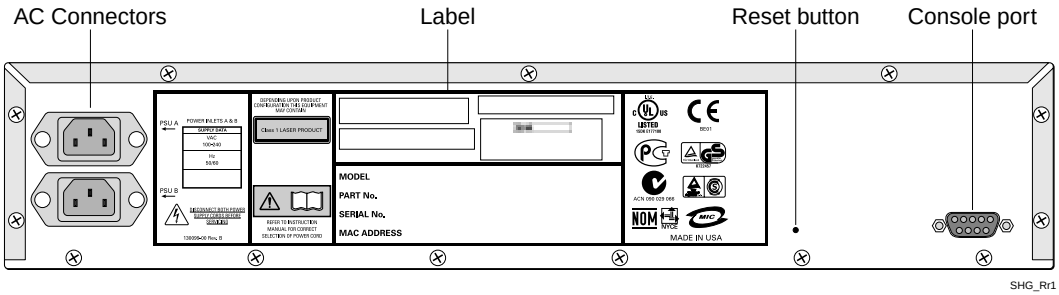
- Unit status
- Management
- Port status
- Port speed

For information about the LEDs and their activity on the Summit1i switch, see “Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si Switch LEDs” on page 90.

Summit1i Switch Rear View

Figure 17 shows the rear view for both available Summit1i switch models.

Figure 17: Rear view of the Summit1i switch



Power Sockets

The Summit1i switch supports up to two power supplies. Each power supply has its own power socket. When a second power supply is installed and connected to a second independent power source, both provide a redundant, load-shared power source to the Summit1i switch. If one of the power sources or power supplies fails, the second power supply provides all power needs which ensures uninterrupted network operation.

CAUTION

Service to Summit1i power supplies should be performed by trained service personnel only.

Label

The label on the rear of the Summit1i switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Console Port

Use the console port (9-pin, “D” type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

Summit5i Switch Front View

As shown in Figure 18, Figure 19, and Figure 20, the Summit5i switch is 2U in height and is available in three port configurations:

- 12 autosensing 100BASE-TX/1000BASE-T ports with RJ-45 connectors and 4 1000BASE-X ports with SC connectors
- 12 1000BASE-SX ports with MT-RJ connectors and 4 1000BASE-X ports with SC connectors
- 12 1000BASE-LX ports with either MT-RJ or LC connectors (Figure 20 shows LC connectors) and 4 1000BASE-X ports with SC connectors

  To determine the type of connectors on your Summit5iLX switch, look at the serial number on the rear of the switch. Serial numbers that start with 0233 and **lower** have MT-RJ connectors. Serial numbers that start with 0234 and **higher** have LC connectors. For example, a Summit5iLX switch with the serial number 0234M-00012 has LC connectors.

Figure 18: Front view of the Summit5i switch with 100BASE-TX/1000BASE-T ports

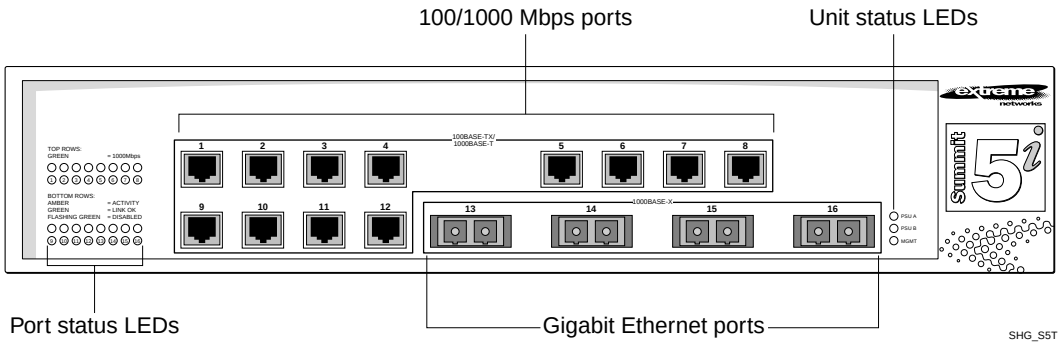


Figure 19: Front view of the Summit5i switch with 1000BASE-SX ports

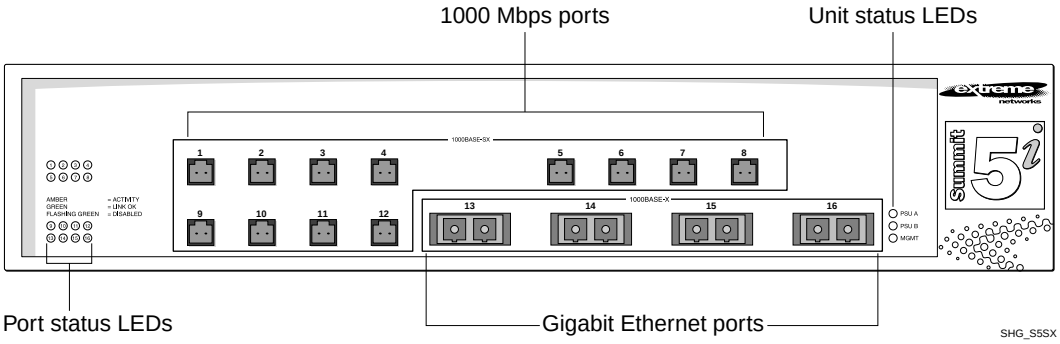
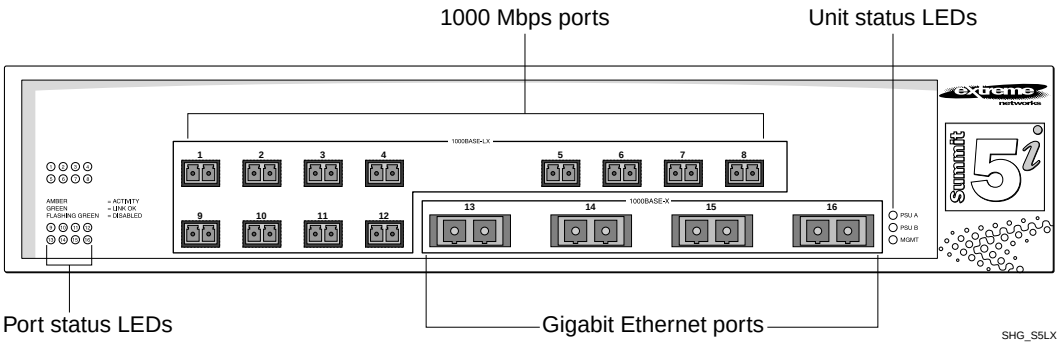


Figure 20: Front view of the Summit5i switch with 1000BASE-LX ports



GBIC Ports

All three Summit5i switch models provide four unpopulated GBIC ports with SC connectors. You can use the following GBICs in the Summit5i switch:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100
- UTP GBIC

GBIC Media Types and Distances

Table 21 describes the media types and associated maximum distances for each GBIC type.

Table 21: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000

Table 21: GBIC types and maximum distances (continued)

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see "GBIC Specifications" on page 32.

LEDs

All three Summit5i models have the following LEDs:

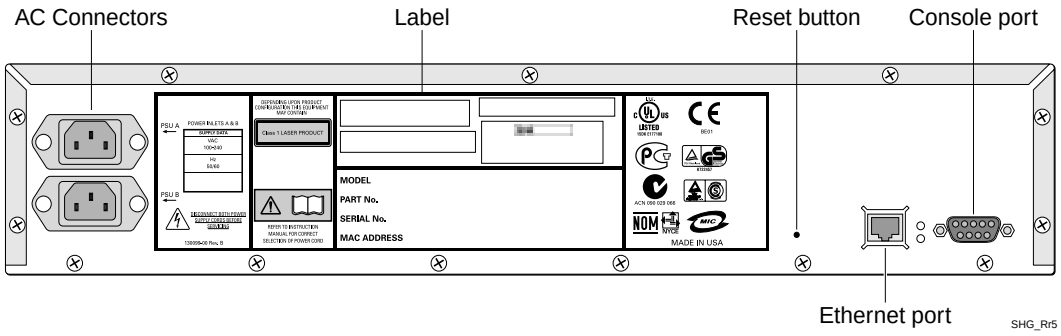
- Unit status
- Management
- Port status
- Port speed
- Management port

For information about the LEDs and their activity on the Summit5i switch, see "Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si Switch LEDs" on page 90.

Summit5i Switch Rear View

Figure 21 shows the rear view for the Summit5i switch.

Figure 21: Rear view of the Summit5i switch



Power Sockets

The Summit5i switch supports up to two power supplies. Each power supply has its own power socket. When a second power supply is installed and connected to a second independent power source, both provide a redundant, load-shared power source to the Summit5i switch. If one of the power sources or

power supplies fails, the second power supply provides all power needs which ensures uninterrupted network operation.

NOTE

Summit5i switch power supplies must be serviced by personnel trained by Extreme Networks, only.

Label

The label on the rear of the Summit5i switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Console Port

Use the console port (9-pin, “D” type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

Management Port

Use the management port (10/100 Mbps Ethernet, RJ-45 connector) to plug an Ethernet cable directly from your laptop into the switch for out-of-band management. This provides you with direct access into the switch and allows you to view and locally manage the switch configurations.

See “Management Ports” in Chapter 1 for more information about the management port.

Summit7i Switch Front View

As shown in Figure 22 and Figure 23, the Summit7i switch is 4U in height and is available in two port configurations:

- 28 autosensing 100BASE-TX/1000BASE-T ports with RJ-45 connectors and 4 1000BASE-X ports with SC connectors
- 28 1000BASE-SX ports with MT-RJ connectors and 4 1000BASE-SX ports with SC connectors

Figure 22: Front view of the Summit7i switch with 100BASE-TX/1000BASE-T ports

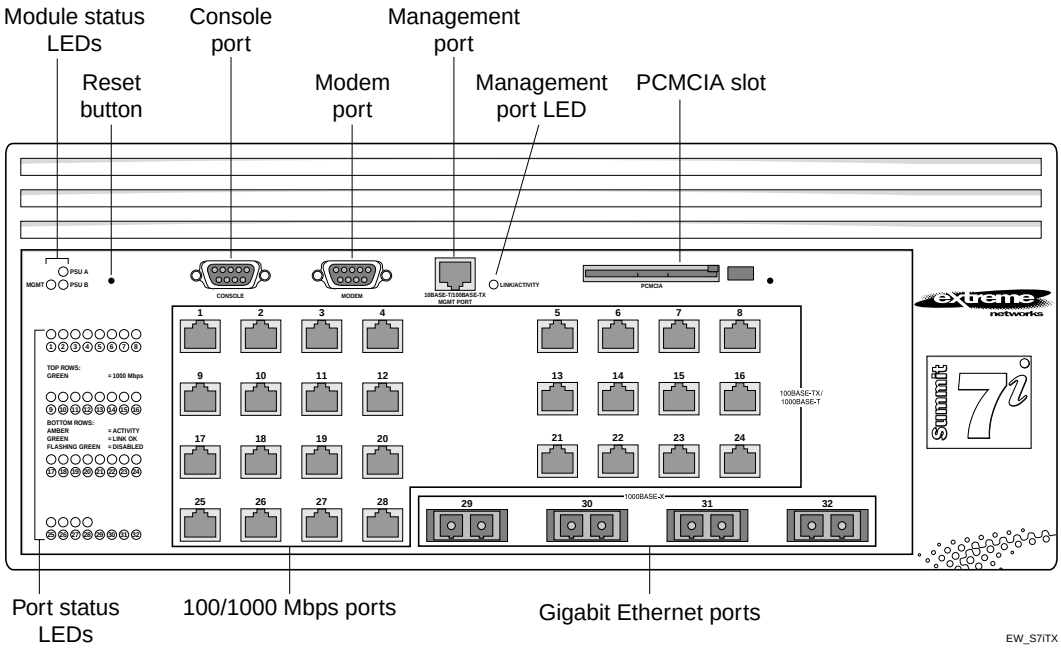
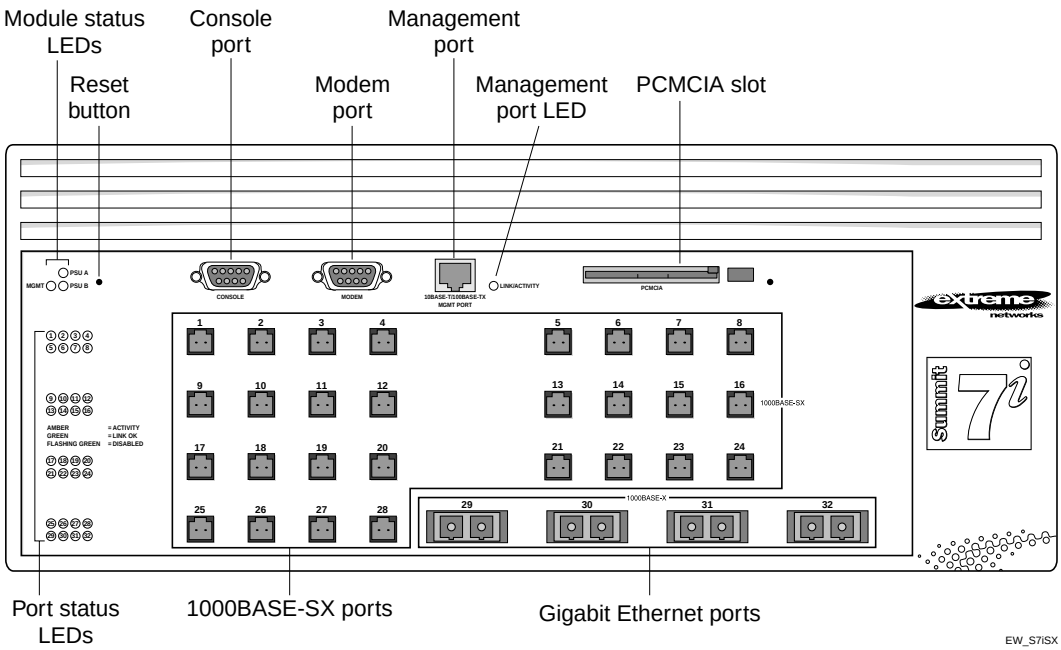


Figure 23: Front view of the Summit7i switch with 1000BASE-SX ports



GBIC Ports

Both Summit7i switch models provide four unpopulated GBIC ports with SC connectors. You can use the following GBICs in the Summit7i switch:

- 1000BASE-SX

- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100
- UTP GBIC

GBIC Media Types and Distances

Table 22 describes the media types and associated maximum distances for each GBIC type.

Table 22: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see "GBIC Specifications" on page 32.

LEDs

Both Summit7i models have the following LEDs:

- Unit status
- Management
- Port status
- Port speed

- Management port

For information about the LEDs and their activity on the Summit7i switch, see “Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si Switch LEDs” on page 90.

Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Console Port

Use the console port (9-pin, “D” type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

Modem Port

Use the modem port to connect a modem for remote access to the command line interface (CLI).

Management Port

Use the management port (10/100 Mbps Ethernet, RJ-45 connector) to plug an Ethernet cable directly from your laptop into the switch for out-of-band management. This provides you with direct access into the switch and allows you to view and locally manage the switch configurations.

See “Management Ports” in Chapter 1 for more information about the management port.

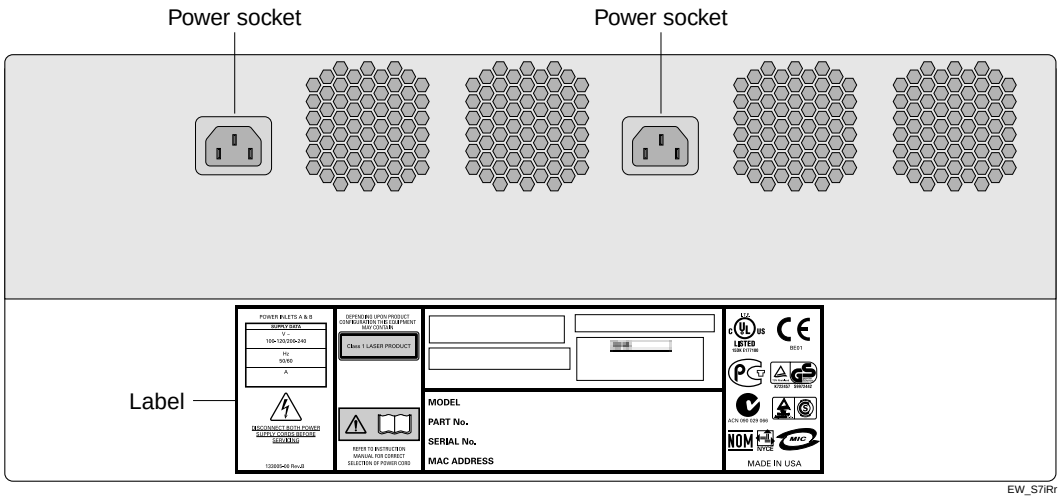
PCMCIA Slot

The PCMCIA slot is reserved for future use.

Summit7i Switch Rear View

Figure 24 shows the rear view for both available Summit7i switch models.

Figure 24: Rear view of the Summit7i switch



Power Sockets

The Summit7i switch supports up to two power supplies. Each power supply has its own power socket. When a second power supply is installed and connected to a second independent power source, both provide a redundant, load-shared power source to the Summit7i switch. If one of the power sources or power supplies fails, the second power supply provides all power needs which ensures uninterrupted network operation.

NOTE

Summit7i switch power supplies must only be serviced by personnel trained by Extreme Networks.

Label

The label on the rear of the Summit7i switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

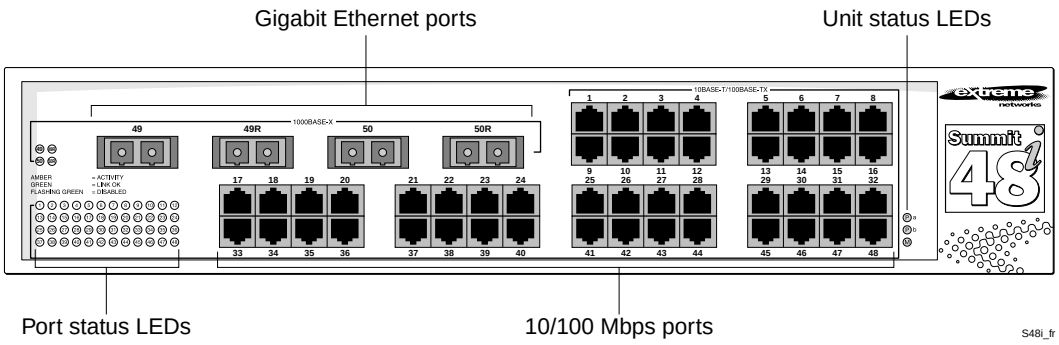
This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

Summit48i Switch Front View

The Summit48i switch is 2U in height and has 48 autosensing 10BASE-T/100BASE-TX ports and 4 1000BASE-X ports with SC connectors.

Figure 25 shows the front view of the Summit48i switch.

Figure 25: Front view of the Summit48i switch



GBIC Ports

The Summit48i switch has two Gigabit Ethernet ports and two redundant Gigabit Ethernet ports. All of the Gigabit Ethernet ports use SC connectors. You can use the following GBICs in the Summit48i switch:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100
- UTP GBIC

GBIC Media Types and Distances

Table 23 describes the media types and associated maximum distances for each GBIC type.

Table 23: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000

Table 23: GBIC types and maximum distances (continued)

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see "GBIC Specifications" on page 32.

LEDs

The Summit48i switch has the following LEDs:

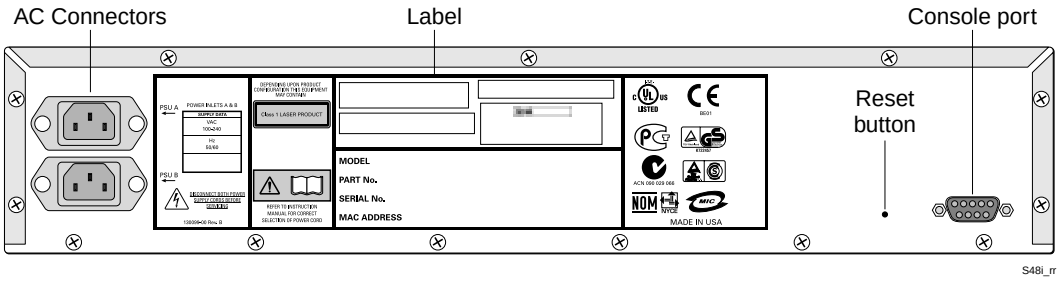
- Unit status
- Management
- Port status
- Port speed

For information about the LEDs and their activity on the Summit48i switch, see "Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si Switch LEDs" on page 90.

Summit48i Switch Rear View

Figure 26 shows the rear view of the Summit48i switch.

Figure 26: Rear view of the Summit48i switch



Power Sockets

The Summit48i switch supports up to two power supplies. Each power supply has its own power socket. When a second power supply is installed and connected to a second independent power source, both provide a redundant, load-shared power source to the Summit48i switch. If one of the power

sources or power supplies fails, the second power supply provides all power needs which ensures uninterrupted network operation. The switch also sends:

- A message to the syslog to indicate which power supply failed
- An SNMP trap to your network management station

NOTE

Summit48i switch power supplies must only be serviced by personnel trained by Extreme Networks.

Label

The label on the rear of the Summit48i switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Console Port

Use the console port (9-pin, “D” type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

Summit48si Switch Front View

The Summit48si switch is 1U in height and has 48 autosensing 10BASE-T/100BASE-TX ports and 2 mini-GBIC ports with LC connectors.

Figure 27 shows the front view of the Summit48si switch.

Figure 27: Front view of the Summit48si switch

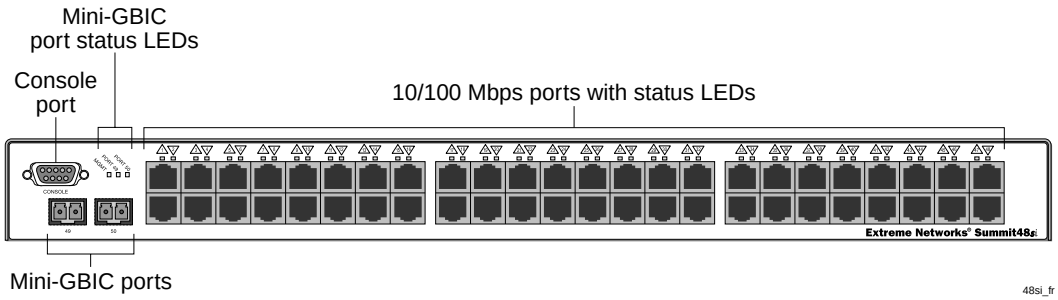
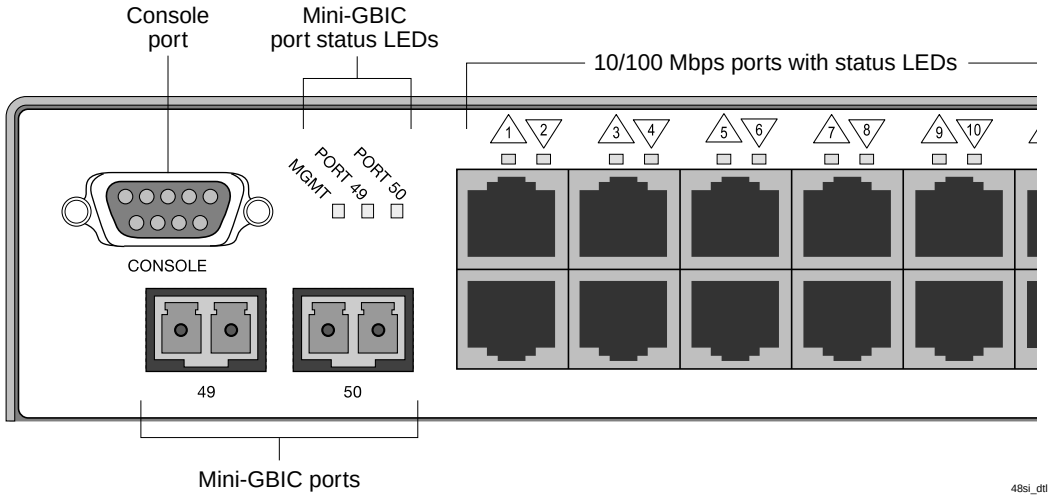


Figure 28 shows a close-up view of the Summit48si LEDs and ports.

Figure 28: View of LEDs and ports on the Summit48si switch



Mini-GBIC Ports

The Summit48si switch has two unpopulated Extreme mini-GBIC ports using LC connectors. You can use the 1000BASE-SX mini-GBIC or the 1000BASE-LX mini-GBIC in the Summit48si switch.

Use only Extreme Networks-certified mini-GBICs, available from Extreme Networks, into the mini-GBIC port in the switch.

NOTE

For more information about mini-GBICs, see "Mini-GBIC Types and Specifications" on page 28.

Console Port

Use the console port (9-pin, "D" type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

LEDs

The Summit48si switch has the following LEDs:

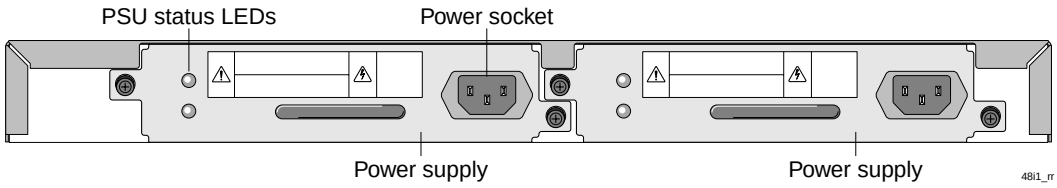
- Management
- Port status

For information about the LEDs and their activity on the Summit48si switch, see “Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si Switch LEDs” on page 90.

Summit48si Switch Rear View

Figure 29 shows the rear view for the Summit48si switch.

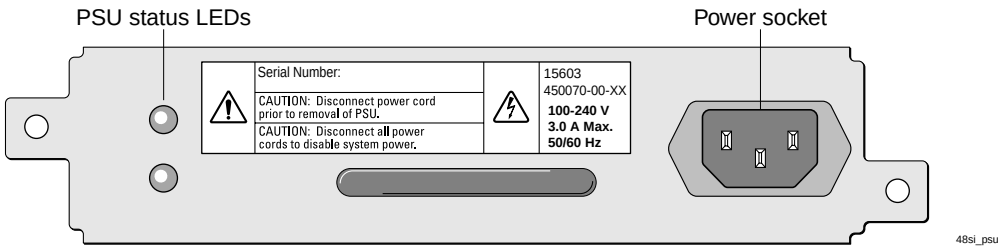
Figure 29: Rear view of the Summit48si switch



Power Supplies

The Summit48si switch supports two hot-insert power supplies, shown in Figure 30, with one power supply preinstalled at the factory. You can remove or install Summit48si power supplies—one at a time—without interrupting operation, and each power supply has its own power socket, which allows you to connect independent power sources for each power supply. One functioning power supply must always be installed. Two power supplies operate in a load-sharing manner and increase the reliability of the switch.

Figure 30: Summit48si power supply



NOTE

See Chapter 5 for information about removing and installing power supplies.

If one of the power supplies fails, or if source power to one of the power supplies fails, the second power supply takes over, ensuring uninterrupted network operation. The switch also sends:

- A message to the syslog telling you which power supply failed
- An SNMP trap to your network management software

Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Summit48si Power Supply LEDs

Table 24 describes the light emitting diode LED activity on the Summit48si power supply.

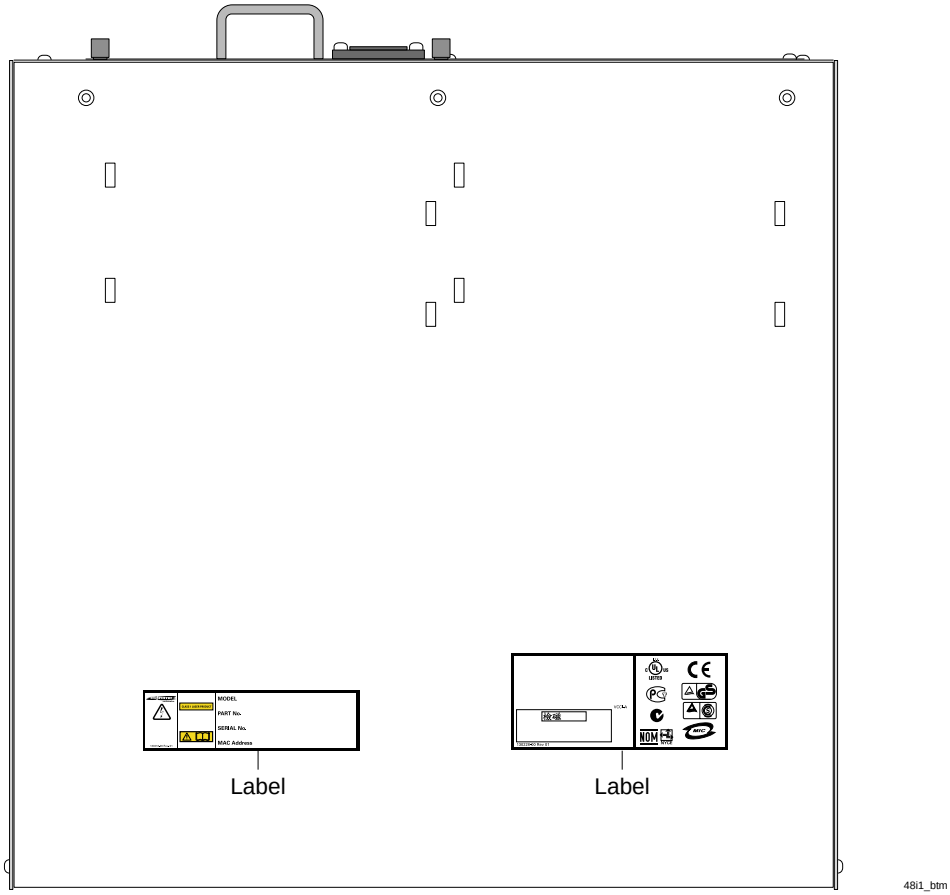
Table 24: Power supply LED activity for the Summit48si

LED	Color	Indicates
PSU Status LED	Green	AC input is above a minimum threshold, or no PSU is present.
	Amber	The PSU is not receiving adequate power.
	Off	No power is present.

Summit48si Switch Bottom View

Figure 31 shows the bottom view for the Summit48si switch.

Figure 31: Bottom view of the Summit48si switch



Labels

The labels on the bottom of the Summit48si switch display important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

NOTE

The label that indicates country and safety certifications for the Summit48si switch is located on the bottom of the switch.

Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si Switch LEDs

Table 25 describes the LED activity on the Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si switches.

Table 25: Switch LED activity for the Summit1i, Summit5i, Summit7i, Summit48i, and Summit48si

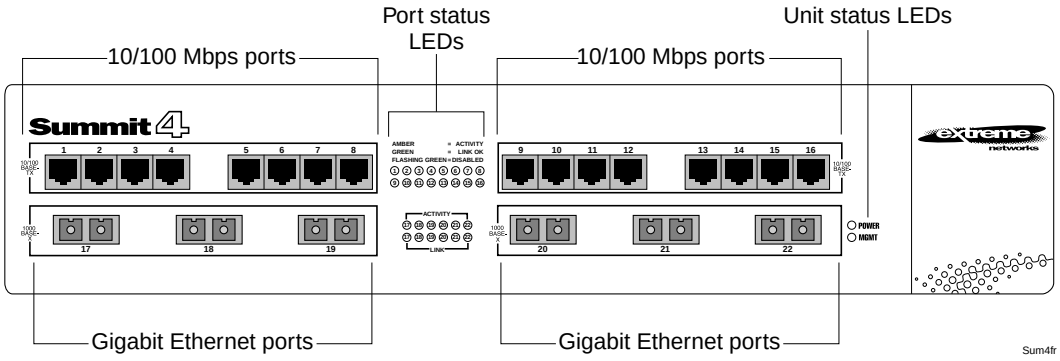
LED	Color	Indicates
Unit Status LEDs		
PSU A, PSU B (all except Summit48si)	Green	The indicated PSU is powered up.
	Amber	The indicated PSU has a failure.
	Green/Amber blinking	The AC power cable is not inserted correctly.
	Off	The PSU is not receiving power or no PSU is present.
MGMT	Green	The switch is operating normally.
		Power On Self Test (POST) or software download in progress.
	Amber	The switch has failed its POST or is experiencing an overheat or fan failure.
Port Status LEDs		
	Green	Link is present; port is enabled.
	Amber	Frames are being transmitted/received on this port.
	Green blinking	Link is present; port is disabled.
	Off	Link is not present.
100/1000 Mbps Speed LEDs		
	Green	Port is operating at 1000 Mbps.
	Off	Port is operating at 100 Mbps.
10/100 Management Port LED (Summit5i and Summit7i)		
	Green	Link is present.
	Amber	Frames are being transmitted.
	Off	Link is not present.

Summit4 Switch Front View

The Summit4 switch is 2U in height and has 16 autosensing 10BASE-T/100BASE-TX ports with RJ-45 connectors and 6 Gigabit Ethernet ports with SC connectors. The Gigabit Ethernet ports support 1000BASE-SX over multimode fiber-optic cable.

Figure 32 shows the front view of the Summit4 switch.

Figure 32: Front view of the Summit4 switch



NOTE

For more information about the supported media types and distances, see "Cable Distances" on page 56.

LEDs

The Summit4 switch has the following LEDs:

- Power
- Management
- Port status
- Gigabit Ethernet port status

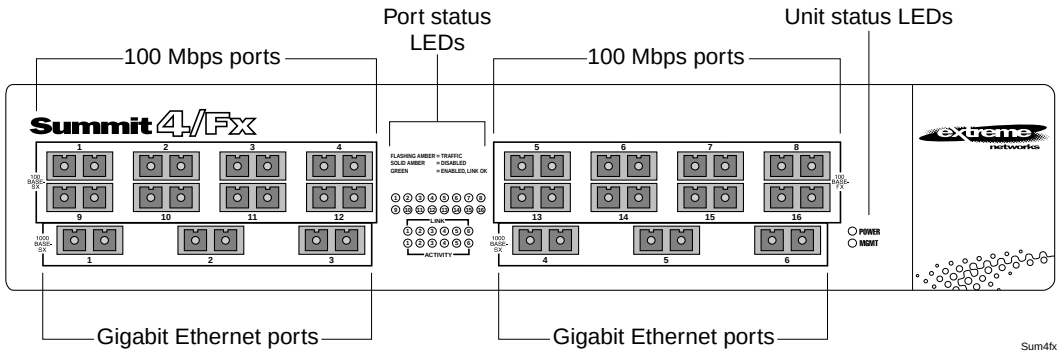
For information about the LEDs and their activity on the Summit4 switch, see "Switch LED activity for the Summit4, Summit4/FX, Summit24, and Summit48" on page 97.

Summit4/FX Switch Front View

The Summit4/FX switch is 2U in height and has 16 100BASE-FX ports and 6 Gigabit Ethernet ports with standard SC connectors. The Gigabit Ethernet ports support 1000BASE-SX over multimode fiber-optic cable.

Figure 33 shows the front view of the Summit4/FX switch.

Figure 33: Front view of the Summit4/FX switch



NOTE

For more information about the supported media types and distances, see "Cable Distances" on page 56.

LEDs

The Summit4/FX switch has the following LEDs:

- Power
- Management
- Port status
- Gigabit Ethernet port status

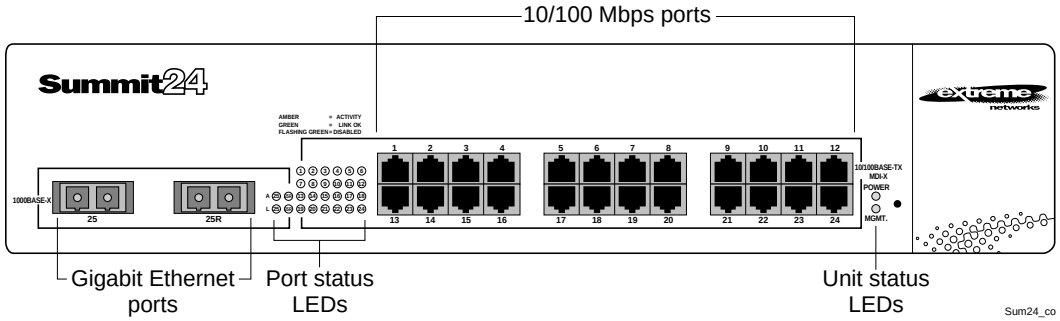
For information about the LEDs and their activity on the Summit4/FX switch, see "Switch LED activity for the Summit4, Summit4/FX, Summit24, and Summit48" on page 97.

Summit24 Switch Front View

The Summit24 switch is 2U in height and has 24 autosensing 10BASE-T/100BASE-TX ports with RJ-45 connectors and 1 Gigabit Ethernet port and 1 redundant Gigabit Ethernet port with standard SC connectors.

Figure 34 shows the front view of the Summit24 switch.

Figure 34: Front view of the Summit24 switch



GBIC Ports

The Summit24 switch provides one Gigabit Ethernet port and one redundant Gigabit Ethernet port. All of the Gigabit Ethernet ports use SC connectors. You can use the following GBICs in the Summit24 switch:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100

GBIC Media Types and Distances

Table 26 describes the media types and associated maximum distances for each GBIC type.

Table 26: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see “GBIC Specifications” on page 32.

LEDs

The Summit24 switch has the following LEDs:

- Power

- Management
- Port status
- Gigabit Ethernet port status

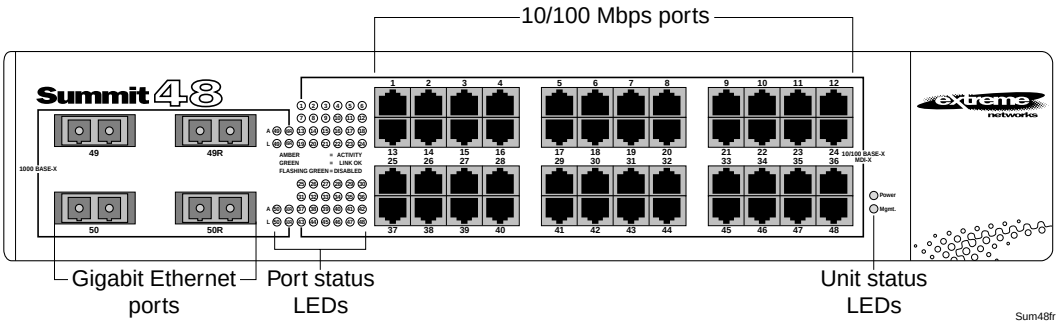
For information about the LEDs and their activity on the Summit24 switch, see “Switch LED activity for the Summit4, Summit4/FX, Summit24, and Summit48” on page 97.

Summit48 Switch Front View

The Summit48 switch is 2U in height and has 48 autosensing 10BASE-T/100BASE-TX ports with RJ-45 connectors and 2 Gigabit Ethernet ports and 2 redundant Gigabit Ethernet ports with SC connectors. All the Gigabit Ethernet ports use SC connectors so that you can attach GBICs that fit your cabling needs.

Figure 35 shows the front view of the Summit48 switch.

Figure 35: Front view of the Summit48 switch



GBIC Ports

The Summit48 switch provides two Gigabit Ethernet port and two redundant Gigabit Ethernet port. All of the Gigabit Ethernet ports use SC connectors. You can use the following GBICs in the Summit48 switch:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100

GBIC Media Types and Distances

Table 27 describes the media types and associated maximum distances for each GBIC type.

Table 27: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about supported GBIC types, see “GBIC Specifications” on page 32.

LEDs

The Summit48 switch has the following LEDs:

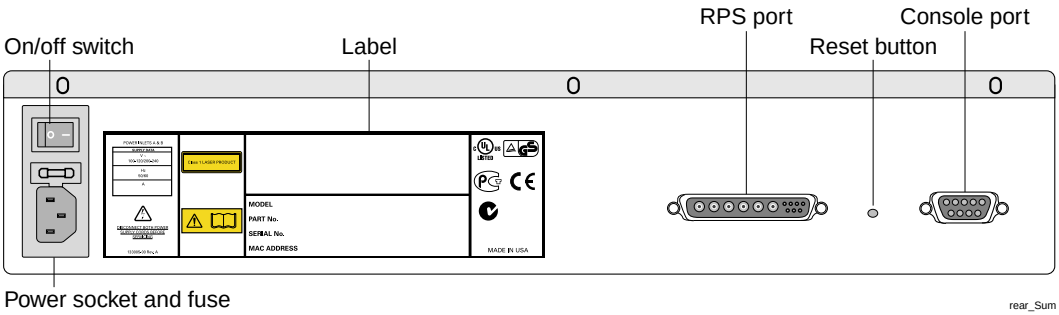
- Power
- Management
- Port status
- Gigabit Ethernet port status

For information about the LEDs and their activity on the Summit48 switch, see “Switch LED activity for the Summit4, Summit4/FX, Summit24, and Summit48” on page 97.

Summit4, Summit24, and Summit48 Switch Rear View

Figure 36 shows the rear view for the Summit4, Summit4/FX, Summit24, and Summit48 switches.

Figure 36: Rear view of the Summit4, Summit4/FX, Summit24, and Summit48 switch



Power Socket

The Summit switch automatically adjusts to the supply voltage. The power supply operates down to 90 V. The fuse is suitable for both 110 VAC and 220-240 VAC operation.

Label

The label on the rear of the Summit4, Summit4/FX, Summit24, and Summit48 switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

Console Port

Use the console port (9-pin, “D” type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

Redundant Power Supply Port

The redundant power supply (RPS) port is used to connect to a Summit RPS. The Summit RPS provides a redundant, load-shared power source to the Summit. If the primary power source for the switch fails, the RPS takes over, ensuring uninterrupted network operation.

When connected to a Summit RPS, the Summit switch can provide status on power and fan operation of the RPS through SNMP, the command-line interface, and the Web interface.

The Summit RPS can simultaneously provide power for up to two Summit switches.

Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Summit4, Summit24, and Summit48 Switch LEDs

Table 28 describes the LED activity on the Summit4, Summit4/FX, Summit24, and Summit48 switches.

Table 28: Switch LED activity for the Summit4, Summit4/FX, Summit24, and Summit48

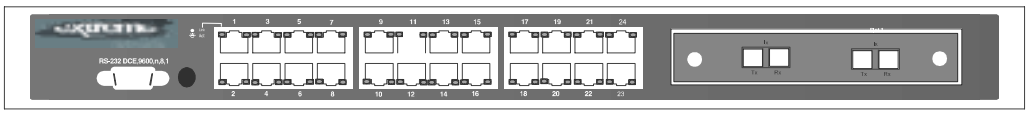
LED	Color	Indicates
Power	Green	The Summit switch is powered up.
	Yellow	The Summit switch is indicating a power failure, overheat, or fan failure.
MGMT	Green blinking	
	• Slow	The Summit switch is operating normally.
	• Fast	Power On Self Test (POST) or software download is in progress.
	Yellow	The Summit has failed its POST.
10/100 Mbps Port Status LEDs		
(all except Summit4/FX)	Green	Link is present; port is enabled.
	Amber	Frames are being transmitted and received on this port.
	Green blinking	Link is present; port is disabled.
	Off	Link is not present.
(Summit4/FX only)	Green	Link is present; port is enabled.
	Amber blinking	Frames are being transmitted and received on this port.
	Amber	Link is present; port is disabled.
	Off	Link is not present.
Gigabit Ethernet Port Status LEDs		
Activity	Yellow	Frames are being transmitted and received on this port.
	Off	No activity on this port.
Link	Green	Link is present; port is enabled for full-duplex operation.
	Green blinking	Link is present; port is disabled.
	Off	Link is not present.

Summit24e2 Switch Front View

The Summit24e2 switch is 1U in height and has 24 autosensing 10BASE-T/100BASE-TX ports using RJ-45 connectors and provides either two unpopulated GBIC ports or two fixed 1000BASE-T ports.

Figure 37 shows the front view of the Summit24e2 switch.

Figure 37: Front view of the Summit24e2 switch



Console Port

Use the console port (9-pin, “D” type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

GBIC Ports

The Summit24e2 switch provides two Gigabit Ethernet ports. All of the Gigabit Ethernet ports use SC connectors. You can use the following GBICs in the Summit24e2 switch:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC

GBIC Media Types and Distances

Table 29 describes the media types and associated maximum distances for each GBIC type.

Table 29: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see “GBIC Specifications” on page 32.

LEDs

The Summit24e2 switch has the following LEDs:

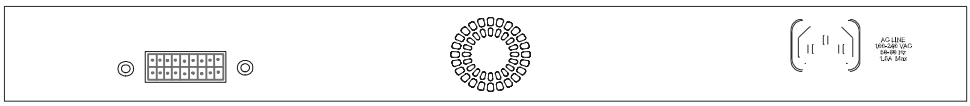
- Power
- Console
- Link / ACK

For information about the LEDs and their activity on the Summit24e2 switch, see “Summit24e2 Switch LEDs” on page 99.

Summit24e2 Switch Rear View

Figure 38 shows the rear view of the Summit24e2 switch.

Figure 38: Rear view of the Summit24e2 switch



Power Socket

The Summit24e2 switch automatically adjusts to the supply voltage. The power supply operates down to 100 V.

Summit24e2 Switch LEDs

Table 30 describes the LED activity on the Summit24e2 switch.

Table 30: Summit24e2 switch LED activity

Power		
	Color	**Indicates**
	Green	The switch is operating normally.
	Amber	The switch has failed its POST.
Console		
	Color	**Indicates**
	Green	Switch is being managed through console port.
	Off	Switch is not being managed through console port.

Table 30: Summit24e2 switch LED activity (continued)

Link/ACK	
Color	**Indicates**
Green	Link is present.
Green blinking	Link is present; switch is transmitting or receiving data.
Off	Link is not present.

NOTE

For more information about configuring and using the Summit24e2 switch, see the Summit24e2 Installation and User Guide*.*

Summit24e3 Switch Front View

The Summit24e3 switch is 1U in height and has 24 autosensing and auto-polarity 10BASE-T/100BASE-TX ports using RJ-45 connectors and 2 mini-GBIC ports using LC connectors.

Figure 39 shows the front view of the Summit24e3 switch.

Figure 39: Front view of the Summit24e3 switch

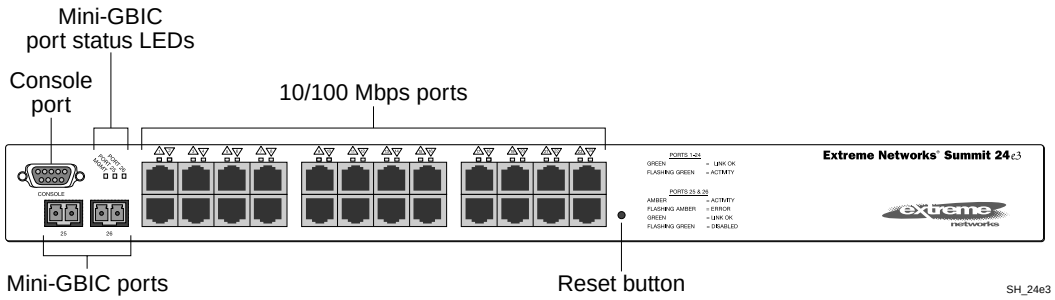
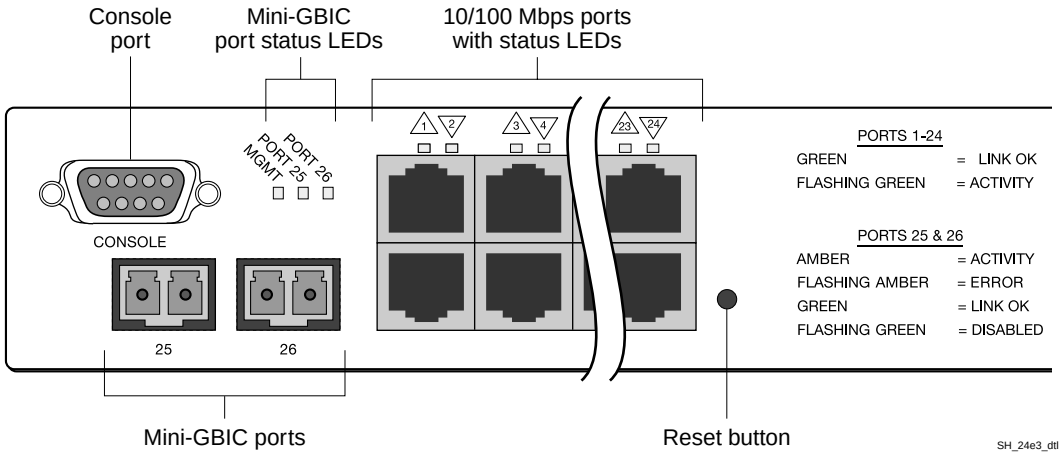


Figure 40 shows a close-up view of the Summit24e3 LEDs and ports.

Figure 40: View of the LEDs and ports on the Summit24e3 switch



Mini-GBIC Ports

The Summit24e3 switch has two unpopulated Extreme mini-GBIC ports using LC connectors. You can use the 1000BASE-SX mini-GBIC or the 1000BASE-LX mini-GBIC in the Summit24e3 switch.

Use only Extreme Networks-certified mini-GBICs, available from Extreme Networks, into the mini-GBIC port in the switch.

NOTE

For more information about mini-GBICs, see "Mini-GBIC Types and Specifications" on page 28.

LEDs

The Summit24e3 switch has the following LEDs:

- Management
- Port status
- Mini-GBIC port status

For information about the LEDs and their activity on the Summit24e3 switch, see "Summit24e3 Switch LEDs" on page 102.

Console Port

Use the console port (9-pin, "D" type connector) to attach a terminal and access the CLI via a serial connection. Use the console port for local management.

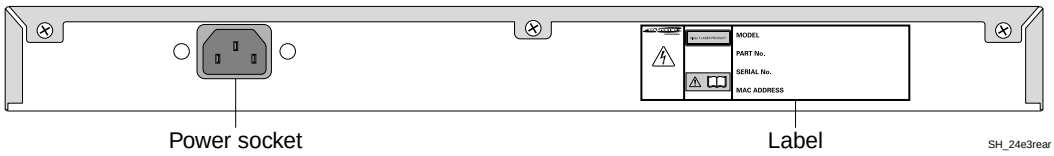
Reset Button

Use the reset button to cycle the switch down and bring the switch back up without powering off the switch. Your saved switch configuration information is not lost; unsaved switch configurations are lost. Use a non-conductive tool to push the reset button.

Summit24e3 Switch Rear View

Figure 41 shows the rear view of the Summit24e3 switch.

Figure 41: Rear view of the Summit24e3 switch



Power Socket

The Summit24e3 switch automatically adjusts to the supply voltage. The power supply operates down to 90 V.

Label

The label on the rear of the Summit24e3 switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

NOTE

The label that indicates country and safety certifications for the Summit24e3 switch is located on the bottom of the switch.

Summit24e3 Switch LEDs

Table 31 describes the LED activity on the Summit24e3 switch.

Table 31: Summit24e3 switch LED activity

Unit Status LED (MGMT LED)	
Color	**Indicates**
Green blinking	The switch is operating normally.
Amber	The switch has failed its POST.

Table 31: Summit24e3 switch LED activity (continued)

10/100 Mbps Port Status LEDs	
Color	**Indicates**
Green	Link is present; port is enabled.
Green blinking	Link is present; there is activity.
Off	Link is not present or the port is disabled.
Mini-GBIC Port Status LEDs	
Color	**Indicates**
Amber	Frames are being transmitted and received on this port.
Amber blinking	A non-supported GBIC is installed on this port.
Green	Link is present; port is enabled for full-duplex operation.
Green blinking	Link is present; port is disabled.
Off	Link is not present.

NOTE

For more information about configuring and using the Summit24e3 switch, see the Summit24e3 Installation and User Guide*.*

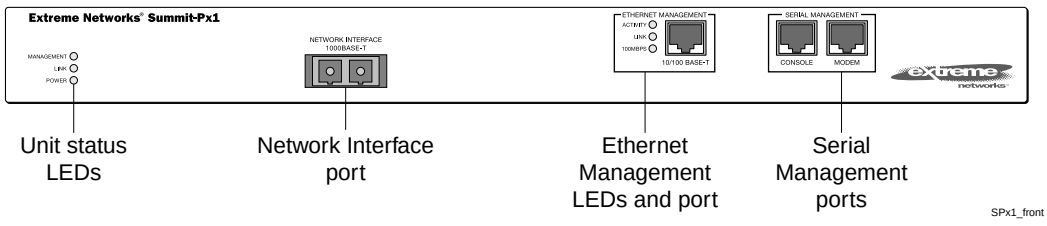
SummitPx1 Application Switch Front View

The SummitPx1 application switch is 1U in height and has the following four ports:

- Network Interface port is a Gigabit Interface Connector (GBIC) with an SC connector used to connect the application switch to your local network.
- 1000BASE-Tx Ethernet Management port with an RJ-45 connector is a 10/100 Mbps Ethernet connection used for out-of-band management.
- Serial Management ports have two serial RJ-45 connectors. Use the console port to connect a terminal for local out-of-band-management. Use the modem port for remote out-of-band management.

Figure 42 shows the front view of the SummitPx1 application switch.

Figure 42: Front view of the SummitPx1 application switch



GBIC Network Interface

The Network Interface port is a Gigabit Interface Connector (GBIC) used to connect the application switch to your local network.

LEDs

The SummitPx1 application switch has the following LEDs:

- Link
- Management
- Power

For information about the LEDs and their activity on the SummitPx1 application switch, see “SummitPx1 Application Switch LEDs” on page 105.

Ethernet Management Port

Use the Ethernet management port to plug an Ethernet cable directly from your laptop into the switch for out-of-band management. This provides you with direct access into the switch and allows you to view and locally manage the switch configurations.

See “Management Ports” in Chapter 1 for more information about the management port.

Serial Management Console Port

Use the console port to connect a terminal for local out-of-band management. The console operates at 9600 baud, 8 data bits, no parity, one stop bit (8-N-1) with no hardware flow control.

The included DB-9 adapter is used to connect the console to a PC serial port, using a straight (1-8, 1-8) cable, such as a standard category 3 or category 5 Ethernet cable.

If you are wiring the console port to a console server, such as a Cisco Systems 2511 Access Server, you must use a null modem cable (1-8, 8-1).

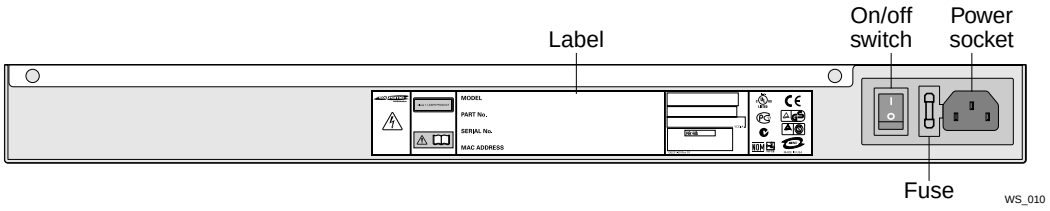
Serial Management Modem Port

The modem port (RJ-45 connector) has the same pin-outs as the console port. Use the modem port for remote out-of-band management.

SummitPx1 Application Switch Rear View

Figure 43 shows the rear view of the SummitPx1 application switch.

Figure 43: Rear view of the SummitPx1 application switch



Power Socket

The SummitPx1 application switch automatically adjusts to the supply voltage. The power supply operates down to 90 VAC. The fuse is suitable for both 110 VAC and 220-240 VAC operation.

Label

The label on the rear of the SummitPx1 application switch displays important information about your switch. Write down your switch information, including the model, part number, serial number and MAC address, before you install your switch.

Serial Number

Refer to the serial number when you contact Extreme Networks technical support.

MAC Address

This label shows the unique Ethernet MAC address that Extreme Networks has assigned to the device.

SummitPx1 Application Switch LEDs

Table 32 describes the LED activity on the SummitPx1 application switch.

Table 32: SummitPx1 application switch LED activity

LED	Color	Indicates
Link	Green	The 1000BASE-T link is operational.
	Yellow flashing	There is activity on this link.
Management	Green flashing	
	• Slow	The SummitPx1 application switch is operating normally.
	• Fast	Power On Self Test (POST) in progress.
	Red	The SummitPx1 application switch has failed its POST.
Power	Green	The SummitPx1 application switch is powered up.
	Red	The SummitPx1 application switch is indicating a power or temperature problem.

NOTE

For more information about configuring and using the SummitPx1 switch, see the SummitPx1 Application Switch Installation and Configuration Guide*.*

5 Summit Switch Installation

You can mount the Summit switch in a rack or place it free-standing on a tabletop.

This chapter describes:

- Mounting the Switch in a Rack on page 107
- Removing and Installing Summit48si Power Supplies on page 111
- Installing the AC Power Cable Retaining Bracket on page 112
- Removing the AC Power Cable Retaining Bracket from a Power Cable on page 114
- Removing the Switch from a Rack on page 114

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any Summit switch or before you attempt to install or remove the Summit48si power supplies.

CAUTION

Use of controls or adjustments of performance or procedures other than those specified herein can result in hazardous radiation exposure.

Mounting the Switch in a Rack

To mount the Summit switch into a rack, you need the following tools, equipment, and resources:

- Helper bracket (provided with the Summit7i switch)
- A minimum of four appropriate screws to secure the helper bracket (not provided)
- Mounting brackets (provided)
- A minimum of four appropriate screws (not provided) to secure the switch into the rack
- # 1 Phillips screwdriver
- If you have a Summit7i switch, a minimum of two people to help install the switch into the rack

CAUTION

Do not use the rack mount kits to suspend the switch under a table or desk, or to attach the switch to a wall.

To mount the Summit switch in a standard 19-inch (48.26 cm) rack:

1 If you are installing a Summit7i switch, mount the helper bracket in the rack, as shown in Figure 44. Use four screws (not provided) that are appropriate to your rack type.

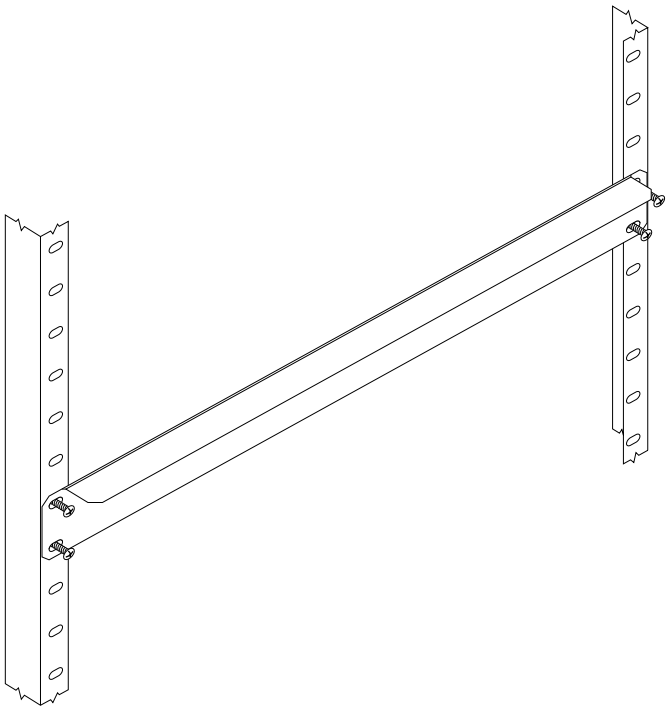
NOTE

The Summit7i switch can weigh up to 55 pounds (24.9 kg).

NOTE

Only the Summit7i switch uses the helper bracket. The helper bracket is not required to rack mount a Summit1i, Summit5i, Summit48i, Summit48si, Summit4, Summit4/FX, Summit24, Summit48, Summit24e2, Summit24e3, or SummitPx1 switch.

Figure 44: Helper bracket for the Summit7i switch



2 Place the switch upright on a secure flat surface with the front of the switch facing you.

3 Remove the switch from the box, and remove the packing material from the switch.

4 Remove the existing screws from the sides of the case (retain the screws for Step 6).

5 Place a mounting bracket over the mounting holes on one side of the unit.

6 Insert and tighten the screws with a suitable screwdriver, as shown in Figure 45 and Figure 46.

Figure 45: An example of fitting the mounting bracket into the switch

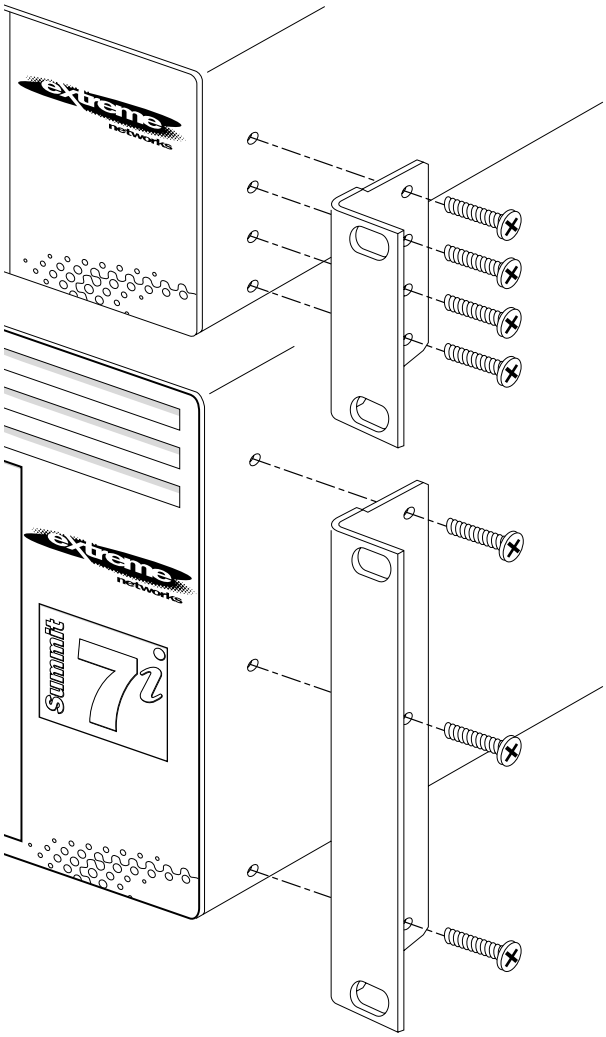
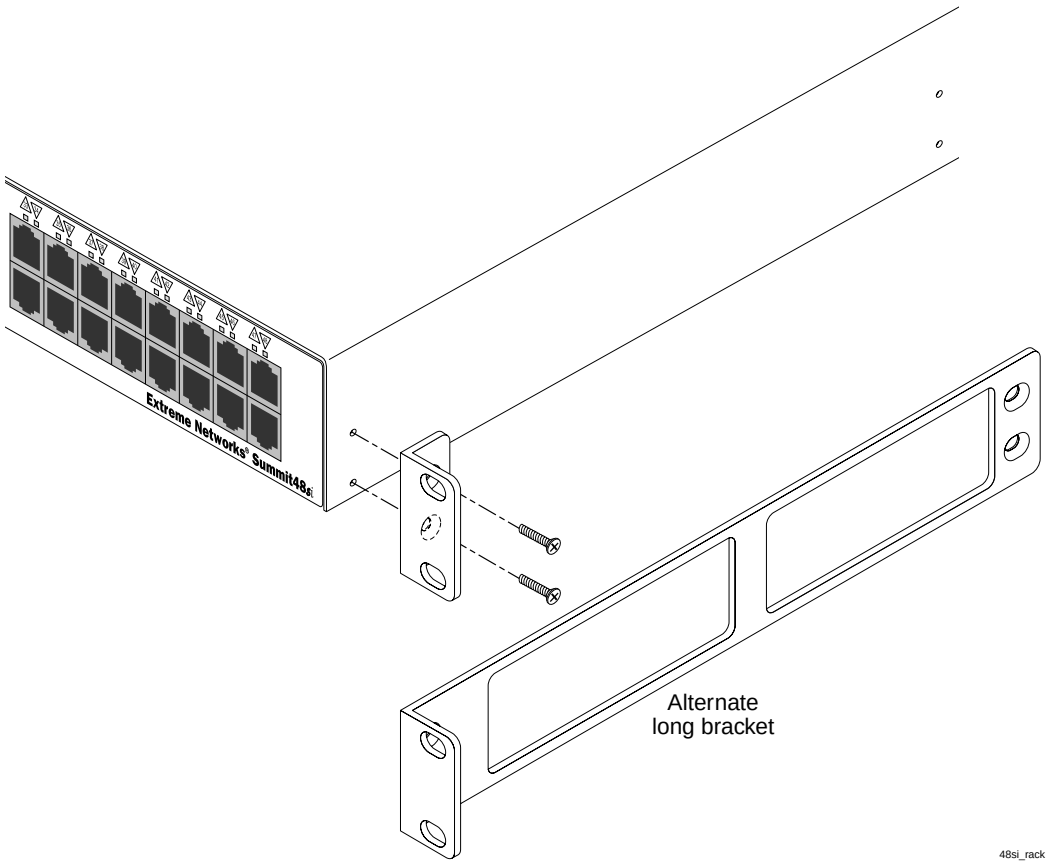


Figure 46: Fitting the mounting bracket into the Summit48si switch



7 Repeat steps 4 through 6 for the other side of the switch.

8 Insert the switch into the rack. Ensure that ventilation holes are not obstructed.

If you are installing a Summit7i switch, you need a minimum of two people to help lift and place the switch on the helper bracket, and slowly guide the switch into the rack.

9 While holding the switch, secure it with suitable screws (not provided).

If you are installing a Summit7i switch, remove the helper bracket after you secure the chassis.

10 Connect the Summit switch to a redundant power supply (if applicable).

11 To turn on power to the system, connect the AC power cable(s) to the switch and then to the wall outlet(s). For the Summit4, Summit24, and Summit48 switches, turn the on/off switch to the on position.

NOTE

The Summit1i, Summit5i, Summit7i, Summit48i, Summit48si, Summit24e3, Summit24e2, and SummitPx1 switches do not have on/off switches.

Placing the Switch on a Table or Shelf

The Summit switch comes with four self-adhesive rubber pads. You can place up to four Summit switches on top of one another.

Apply the pads to the underside of each switch, and place a pad at each marked corner of the switch. Place the switches on top of one another, ensuring that the corners align.

Verifying a Successful Installation

After you supply power to the Summit switch, the switch performs a power-on self test (POST).

During the POST, all ports are temporarily disabled, the packet LED is off, the power LED is on, and the MGMT LED flashes. The MGMT LED flashes until the switch successfully passes the POST.

If the switch passes the POST, the MGMT LED blinks at a slow rate (one blink per second). If the switch fails the POST, the MGMT LED shows a solid yellow light.

NOTE

See Chapter 4 for more information about Summit LED activity.

Removing and Installing Summit48si Power Supplies

This section applies to the Summit48si switch only. The Summit48si comes with a minimum of one power supply preinstalled at the factory. If you have a Summit48si switch, follow the instructions in this section for removing and installing the Summit48si power supplies.

NOTE

Summit48si power supplies must be serviced by trained service personnel.

NOTE

If you need to power down the switch, remove all of the power cords from the installed power supplies.

To remove a Summit48si power supply:

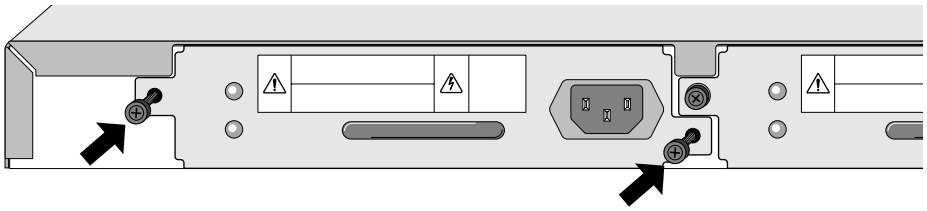
1 Remove the power cable from the wall outlet and then from the switch.

CAUTION

Shock hazard.

2 Use a #2 Phillips screwdriver to unscrew the two retaining screws, as shown in Figure 47.

Figure 47: Removing the retaining screws from the Summit48si power supply

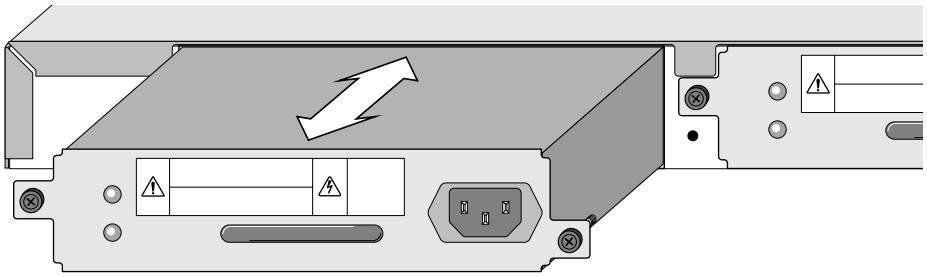


3 Use the handle to slowly pull the power supply towards you, as shown in Figure 48.

WARNING!

Do not insert your fingers or hands into the empty power supply bay.

Figure 48: Removing the Summit48si power supply



4 If you are not going to install a replacement power supply, cover the power supply bay with the blank faceplate that was originally supplied with the switch. Otherwise, follow the Summit48si power supply installation procedure to install a new power supply.

To install a Summit48si power supply:

1 Remove the blank faceplate from the power supply bay.

2 Use the handle to gently slide the power supply into the bay.

3 Replace and tighten the two captive retaining screws using a #2 Phillips screwdriver.

4 To turn the power supply on, connect the AC power cable to the power supply and then to the wall outlet.

WARNING!

Do not plug in the power cable into the power supply unless the power supply is installed.

5 Keep the faceplate and the power supply packaging for future use.

Installing the AC Power Cable Retaining Bracket

This section describes how to install the AC power cable retaining bracket on a Summit switch.

To install an AC power cable retaining bracket:

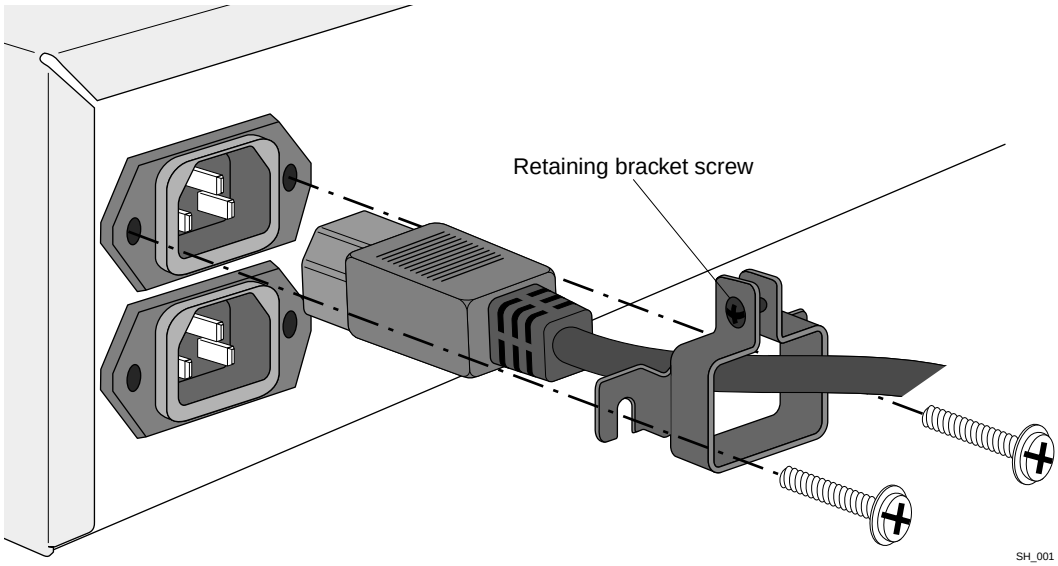
1 Disconnect the power cable from the switch **and** the power source.

2 Remove the two retaining screws from the power socket on the rear of the switch using a #2 Phillips screwdriver.

Keep the screws for future use.

3 Slide the retaining bracket over the power cable, as shown in Figure 49. If necessary, loosen the retaining bracket screw.

Figure 49: Attaching the retaining bracket to the power socket



4 Connect the power cable to the switch.

CAUTION

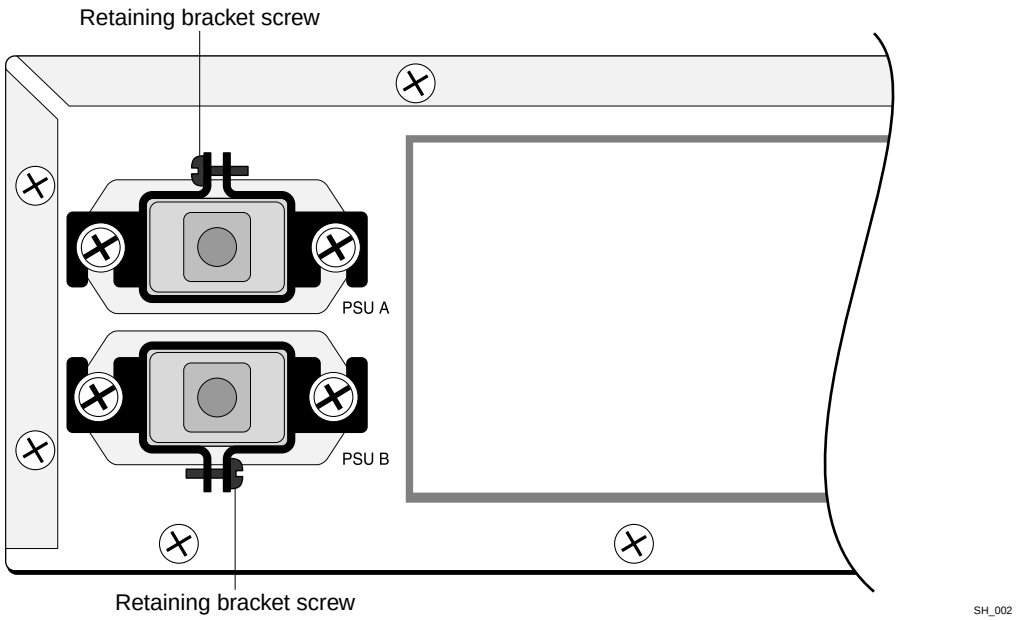
Do not connect the power cable to the power source at this time.

5 Attach the retaining bracket to the power socket using the existing screws, as shown in Figure 49.

6 Tighten the retaining bracket screw.

If your switch has two power supplies, install the second retaining bracket now by repeating the preceding steps. Align the retaining brackets as shown in Figure 50 so that the retaining bracket screws do not interfere with each other.

Figure 50: Attaching two retaining brackets



7 Connect the power cable(s) to the power source.

Removing the AC Power Cable Retaining Bracket from a Power Cable

Before you can remove a power cable from the power supply, you need to loosen the retaining bracket from the cable.

To remove the AC power cable retaining bracket from a power cable:

1 Disconnect the power cable from the power source.

2 Loosen the retaining bracket screw. To locate the retaining bracket screw, see either Figure 49 or Figure 50.

3 Gently remove the power cable from the power supply.

If you are installing a replacement power supply for the Summit48si switch, see “Removing and Installing Summit48si Power Supplies” on page 111 for installation procedures. After you install the replacement power supply, you need to install a new AC power cable retainer. See “Installing the AC Power Cable Retaining Bracket” on page 112 for more details.

If you are installing a replacement power cable, you need to tighten the AC power cable retaining bracket to the new power cable.

Removing the Switch from a Rack

To uninstall the Summit switch from a rack, you need the following tools, equipment, and resources:

- Helper bracket (provided with the Summit7i switch)

- A minimum of four appropriate screws to secure the helper bracket (not provided)
- # 1 Phillips screwdriver
- If you have a Summit7i switch, a minimum of two people to help remove the switch from the rack

To remove the Summit switch from a standard 19-inch (48.26 cm) rack:

1 Unplug the power cable(s) from the from the wall outlet(s) and then from the switch. For the Summit4, Summit 24, and Summit48 switches, turn the on/off switch to the off position.

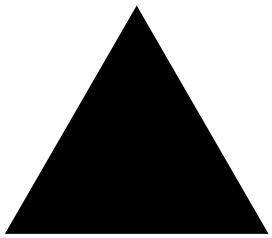
2 Disconnect the Summit switch from the redundant power supply (if applicable).

3 If you are removing a Summit7i switch, mount the helper bracket in the rack directly beneath the switch using four screws that are appropriate for your rack.

4 Unscrew the chassis from the rack.

5 Have a minimum of two people gently remove the chassis from the rack and place it on a secure, flat surface with the front of the chassis facing you.

6 Unscrew the helper bracket and remove it from the rack.



Part 4
Alpine Switch

6 Alpine 3800 Series Switch Overview

The Alpine 3800 series switch is a chassis-based, Ethernet service provisioning switch designed for edge and aggregation applications. The Alpine 3800 series switch is flexible and scalable, making it easy for you to meet the changing requirements of your network. The combination of BlackDiamond, Alpine, and Summit switches delivers a consistent end-to-end network solution that provides a nonblocking architecture, wire-speed switching, wire-speed IP routing, and policy-based Quality of Service (QoS).

This chapter describes:

- Summary of Features on page 119
- Switch Components on page 121
- Following Safety Information on page 122

Summary of Features

This section describes the features of the Alpine family of switches. If the information in the release notes differs from the information in this guide, follow the release notes. For more information about configuring the switch, refer to the *ExtremeWare Software User Guide* and *The ExtremeWare Command Reference Guide*.

The features of the Alpine 3800 series switch include:

- A 9-slot chassis that can be populated with up to eight input/output (I/O) modules and one Switch Management Module (SMMi) (Alpine 3808)
- A 5-slot chassis that can be populated with up to four I/O modules and one SMMi (Alpine 3804)
- A 3-slot chassis that can be populated with up to three I/O modules (Alpine 3802)
- I/O modules that are hot-swappable, and include Gigabit Ethernet or 10/100 Mbps Ethernet ports
- Redundant, load-sharing, hot-swappable power supplies (Alpine 3808 and Alpine 3804)
- Field-replaceable, hot-swappable fan tray (Alpine 3808 and Alpine 3804)
- Fully nonblocking operation
  - All ports transmit and receive packets at wire speed
- Autonegotiation for half-duplex or full-duplex operation on 10/100 Mbps ports
- Load-sharing on multiple ports
- VLANs, including support for IEEE 802.1Q

- STP (IEEE 802.1D) with multiple STP domains
- Policy-Based QoS
- Wire-speed IP routing
- IP multinetting
- DHCP/BOOTP relay
- RIP version 1 and RIP version 2
- OSPF routing protocol
- IPX routing, including RIP and SAP
- Wire-speed IP multicast routing support
- Internet Group Multicast Protocol (IGMP) and IGMP snooping
- DVMRP
- IGMP snooping to control IP multicast traffic
- Console (RS-232) CLI connection
- Telnet CLI connection
- ExtremeWare VistaWeb-based management interface
- SNMP support
- Dedicated 10BASE-T/100BASE-TX port for out-of-band management via CLI, ExtremeWare Vista, or SNMP

Port Connections

The Alpine 3800 series switches support the following port configurations that are available on the different Alpine I/O modules as described in Table 33.

CAUTION

Modules that use SX, LX, and LX70 interfaces contain Class 1 laser devices. Invisible laser radiation can occur when open. Avoid direct eye exposure to beam.

Table 33: Port configurations available on Alpine I/O modules

Ethernet Ports						
Module	**10BASE-T/ 100BASE-TX**	**100BASE-TX/ 1000BASE-T**	**GBIC**	**1000BASE-SX**	**100BASE-FX**	**OTHER**
GM-4Ti		4				
GM-4Xi			4[1]			
GM-4Si				4		
GM-WDMi						1 WDM[2]
FM-32Ti	32					
FM-24Ti	24					
FM-24SFi					24	
FM-24MFi					24	

Table 33: Port configurations available on Alpine I/O modules (continued)

Ethernet Ports						
Module	**10BASE-T/ 100BASE-TX**	**100BASE-TX/ 1000BASE-T**	**GBIC**	**1000BASE-SX**	**100BASE-FX**	**OTHER**
FM-8Vi						8 VDSL[3]
WM-4T1i	2					4 T1
WM-4E1i	2					4 E1
WM-1T3i	2					1 T3

1 The GM-4Xi supports 1000BASE-SX, 1000BASE-LX, and 1000BASE-LX70.
2 The GM-WDMi supports four Gigabit Ethernet channels over single fiber using wavelength division multiplexing.
3 The FM-8Vi has eight internal loopback ports for rate shaping. Module supports 10BASE-S.

Switch Components

There are three models in the Alpine 3800 series: the Alpine 3808 switch, the Alpine 3804 switch, and the Alpine 3802 switch. This section describes the three Alpine models.

Alpine 3808 Switch

The Alpine 3808 switch consists of the following components:

- One 9-slot chassis with backplane
- Eight I/O module slots, labeled 1 through 8
- One SMMi slot
- One or two power supplies (accessed from the front of the unit)
- One fan tray (accessed from the front of the unit)
- One electromagnetic discharge (ESD) wrist strap connector

Alpine 3804 Switch

The Alpine 3804 switch consists of the following components:

- One 5-slot chassis with backplane
- Four I/O module slots, labeled slots 1 through 4
- One SMMi slot
- One or two power supplies (accessed from the rear of the unit)
- One fan tray
- One electromagnetic discharge (ESD) wrist strap connector

Alpine 3802 Switch

The Alpine 3802 switch consists of the following components:

- One 3-slot chassis with backplane

- One integrated management module
- Three I/O module slots, labeled slots 1 through 3
- One or two preinstalled power supplies
- One fan tray
- One electromagnetic discharge (ESD) wrist strap connector
- Six light emitting diode (LED) displays

CAUTION

The Alpine 3802 switch has an integrated Switch Management Module (SMMi). The integrated Switch Management Module is not hot-swappable or user removable. Do not attempt to remove the integrated Switch Management Module. Contact Extreme Networks Customer Support if you experience problems.

Power Supply

The Alpine 3800 series switch supports both AC and DC power supplies. If two power supplies are installed in the switch, both installed power supplies must be of the same type. The AC power supplies auto-sense for 110 VAC and 220 VAC power. The DC power supplies require -48 VDC nominal input line voltage.

The Alpine 3800 series switch supports the following power supply configurations:

Table 34: Supported power supplies for the Alpine 3800 series switch

Switch Model	AC power supply	DC power supply	Hot-swappable
Alpine 3808[1]	Up to two AC power supplies can be installed.	Up to two DC power supplies can be installed.	Yes
Alpine 3804[1]	Up to two AC power supplies can be installed.	Up to two DC power supplies can be installed.	Yes
Alpine 3802[1]	Up to two AC power supplies can be installed.[2]	Two DC power supplies must be installed.[3]	No

1 All installation, maintenance, and removal of a power supply must be done by qualified, trained service personnel only.
2 If you have one AC power supply installed in the Alpine 3802 switch, it must be installed in the lower power supply tray (PSU A).
3 If you require DC power supplies in the Alpine 3802 switch, you must have two DC power supplies installed.

Following Safety Information

WARNING!

Read the safety information in Appendix A thoroughly before installing your Extreme Networks switch. Failure to follow this safety information can lead to personal injury or damage to the equipment.

- All service to components of an Alpine 3800 series switch should be performed by trained service personnel only. Service personnel are persons having appropriate technical training and experience

necessary to be aware of the hazards to which they are exposed in performing a task and of measures to minimize the danger to themselves or other persons.

NOTE

Electronic components are sensitive to static electricity. ESD originating from you or from objects around you can damage these components. Exercise every possible precaution to prevent ESD when working around printed circuit assemblies.

Keep all printed circuit assemblies in protective ESD-preventive sacks or place them on antistatic mats until you are ready to install them. Wear an ESD-preventive wrist strap and ensure that the leash is securely grounded before handling a bare printed circuit assembly.

- Some devices, such as I/O modules, contain fiber optic ports. To protect your eyes, you should never look at the fiber optic ports while they are on, or look directly at the fiber cable ends when they are on.

7 Alpine 3800 Series Switch Chassis

There are three models in the Alpine 3800 series: the Alpine 3808 switch, the Alpine 3804 switch, and the Alpine 3802 switch.

This chapter describes:

- Alpine 3800 Series Architecture on page 125
- Installing the Chassis on page 135
- Removing the Chassis on page 138

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any Alpine chassis.

Alpine 3800 Series Architecture

This section describes and shows the architecture of the Alpine 3800 series chassis. For each chassis, the front view shows an example of a completely installed chassis with optional I/O modules that you can install in the chassis. The rear view shows the back of the chassis.

Alpine 3808 Switch Front View

The Alpine 3808 switch consists of the following components:

- One 9-slot chassis with backplane
- Eight I/O module slots, labeled 1 through 8
- One SMMi slot
- One or two power supplies (accessed from the front of the unit)
- One fan tray (accessed from the front of the unit)
- One electromagnetic discharge (ESD) wrist strap connector

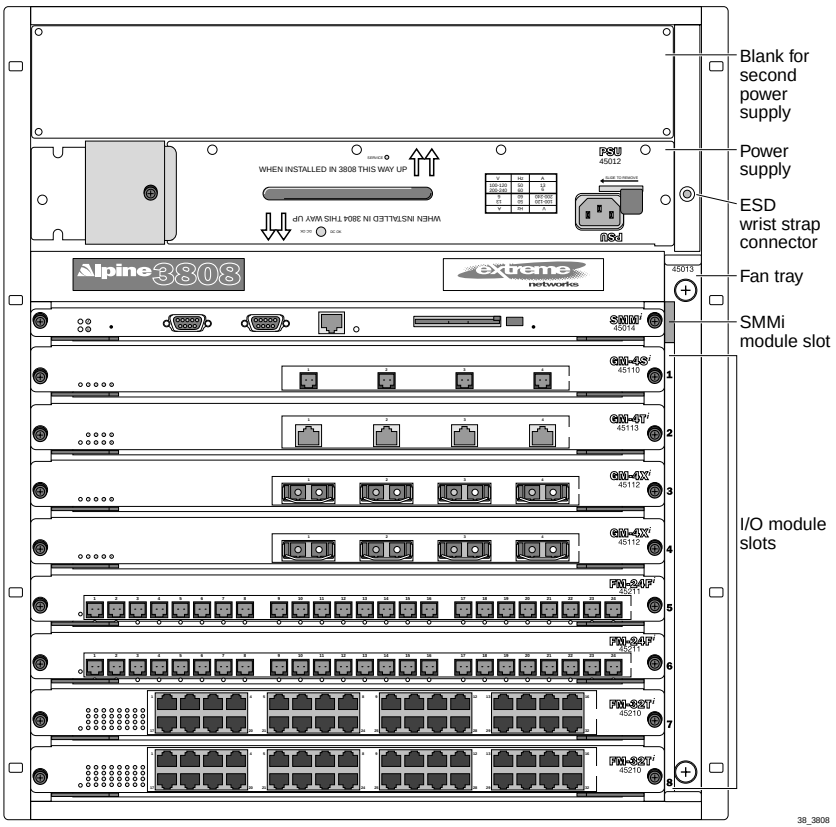
The Alpine 3808 switch can support the following number of ports and types of port configurations:

- Up to 256 switched 10BASE-T/100BASE-TX Ethernet ports

- Up to 192 switched 100BASE-FX Fast Ethernet ports
- Up to 32 switched Gigabit Ethernet ports
- Up to 32 switched T1 ports
- Up to 32 switched E1 ports
- Up to 48 switched Ethernet over VDSL ports
- Up to 8 switched T3 ports

Figure 51 shows the Alpine 3808 chassis installed with one required SMMi and eight optional I/O modules.

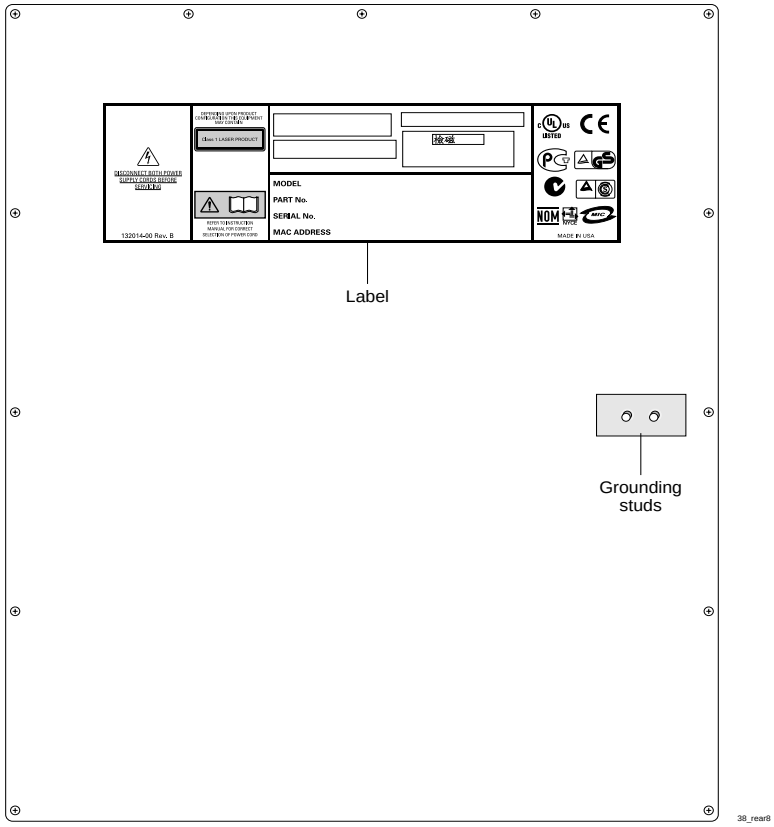
Figure 51: Front view of the Alpine 3808 switch with sample I/O modules installed



Alpine 3808 Switch Rear View

Figure 52 shows the rear view of the Alpine 3808 switch.

Figure 52: Rear view of the Alpine 3808 switch



The rear view of the Alpine 3808 switch provides:

- Access to the grounding studs
- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

Alpine 3804 Switch Front View

The Alpine 3804 switch consists of the following components:

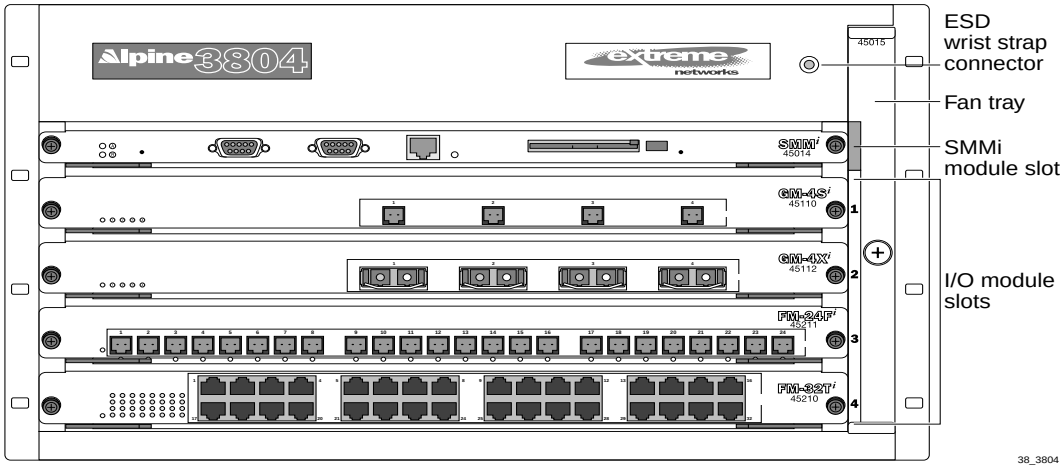
- One 5-slot chassis with backplane
- Four I/O module slots, labeled slots 1 through 4
- One SMMi slot
- One or two power supplies (accessed from the rear of the unit)
- One fan tray
- One electromagnetic discharge (ESD) wrist strap connector

The Alpine 3804 switch can support the following number of ports and types of port configurations:

- Up to 128 switched 10BASE-T/100BASE-TX Ethernet ports
- Up to 96 switched 100BASE-FX Fast Ethernet ports
- Up to 16 switched Gigabit Ethernet ports
- Up to 16 switched T1 ports
- Up to 16 switched E1 ports
- Up to 32 switched Ethernet over VDSL ports
- Up to 4 switched T3 ports

Figure 53 shows the Alpine 3804 chassis installed with one required SMMi and five optional I/O modules.

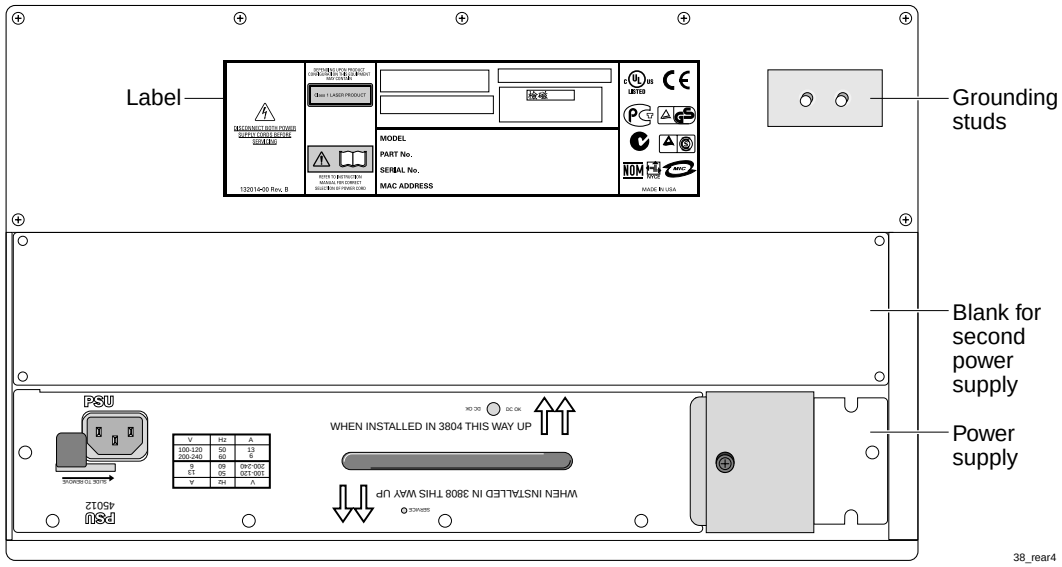
Figure 53: Front view of the Alpine 3804 switch with sample I/O modules installed



Alpine 3804 Switch Rear View

Figure 54 shows the rear view of the Alpine 3804 switch.

Figure 54: Rear view of the Alpine 3804 switch



The rear view of the Alpine 3804 switch provides:

- Access to the power supply
- Access to the grounding studs
- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

Alpine 3802 Switch Front View

The Alpine 3802 switch consists of the following components:

- One 3-slot chassis with backplane
- One integrated management module
- Three I/O module slots, labeled slots 1 through 3
- One or two preinstalled power supplies
- One fan tray
- One electromagnetic discharge (ESD) wrist strap connector
- Six light emitting diode (LED) displays

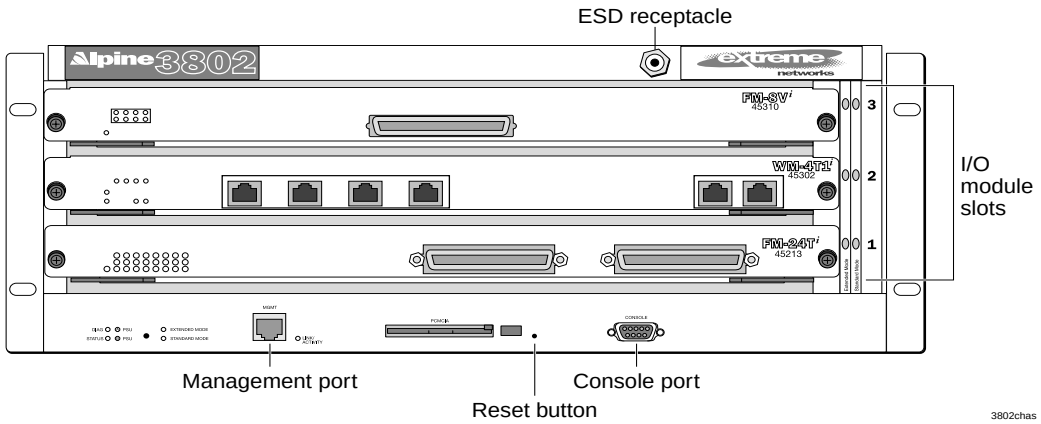
The Alpine 3802 switch can support the following number of ports and types of port configurations:

- Up to 64 switched 10BASE-T/100BASE-TX Ethernet ports
- Up to 48 switched 100BASE-FX Fast Ethernet ports
- Up to 8 switched Gigabit Ethernet ports

- Up to 12 switched T1 ports
- Up to 12 switched E1 ports
- Up to 16 switched Ethernet over VDSL ports
- Up to 3 switched T3 ports

Figure 55 shows the Alpine 3802 chassis installed with three optional I/O modules.

Figure 55: Front view of the Alpine 3802 switch with sample I/O modules installed



The Alpine 3802 switch provides up to 16 Gigabits of full-duplex bandwidth and supports all existing Alpine Ethernet I/O modules (I/O modules with the green stripe), including the Alpine Access I/O modules (I/O modules with the silver stripe). For more information about the Alpine I/O modules, see Chapter 10.

The Alpine 3802 switch operates in three modes:

- Extended—In extended mode, all slots (slots 1, 2, and 3) are enabled. Slot 1 supports all existing Alpine modules: Alpine Ethernet I/O modules (green stripe) and Alpine Access I/O modules (silver stripe). Slots 2 and 3 support only Alpine Access I/O modules (silver stripe).
- Standard—In standard mode, only slots 1 and 2 are enabled. Slot 3 is disabled. Slots 1 and 2 support all existing Alpine modules: Alpine Ethernet I/O modules (green stripe) and Alpine Access I/O modules (silver stripe).
- Auto—In auto mode, the switch determines if it is in standard or extended mode depending on the type of modules installed in the chassis or the slot preconfigurations.

You can use the `configure switch {auto | extended | standard}` command to configure the switch to operate in a specific mode. By default, the switch operates in auto mode.

NOTE

Slot 3 in the Alpine 3802 can accept only Alpine Access I/O modules (silver stripe). You cannot insert an Alpine Ethernet I/O module (green stripe) into slot 3.

Alpine 3802 Switch LEDs

Table 35 describes the LED activity of the Alpine 3802 switch.

Table 35: Alpine 3802 switch LEDs

LED	Color	Indicates
DIAG	Green blinking	Power-on Self Test (POST) is running
	Off	Normal operation
STATUS	Green blinking	Normal operation
	Yellow blinking	Critical error, fan failure, or over temperature
	Off	Unit is not receiving power
PSU A, PSU B	Green	Normal operation
	Amber	PSU failure
	Off	PSU not present or not powered
EXTENDED MODE	Green	Extended mode operation
	Off	Not operating in extended mode
STANDARD MODE	Green	Standard mode operation
	Off	Not operating in standard mode

NOTE

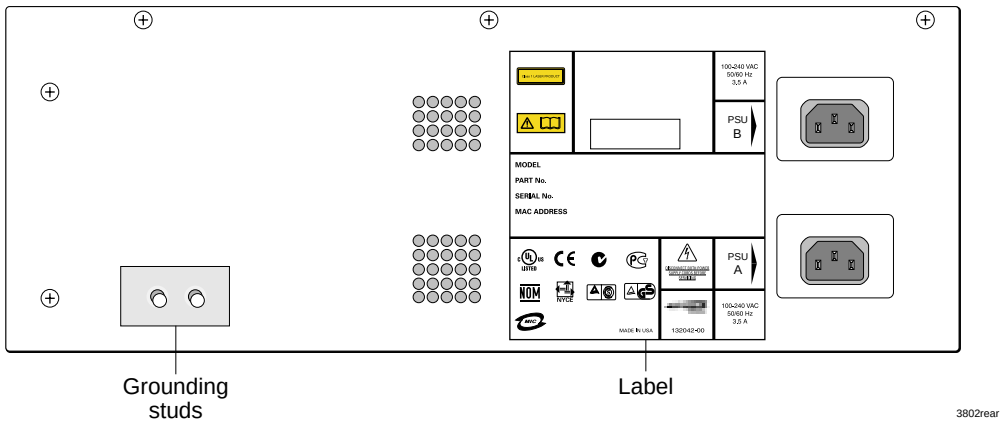
The Alpine 3802 switch has an integrated Switch Management Module that is located in the chassis.The module is not hot-swappable or user-removable. Do not attempt to remove. Contact Extreme Networks Customer Support if you experience problems.

Alpine 3802 Switch Rear View

The Alpine 3802 switch comes in two versions: AC and DC . Figure 56 shows the rear view of the Alpine 3802 switch with AC power supplies installed. Figure 57 shows the rear view of the Alpine 3802 switch with DC power supplies installed.

Alpine 3802 AC Rear View

Figure 56: Rear view of the Alpine 3802 switch with dual AC power supplies



The rear view of the Alpine 3802 AC switch provides:

- Access to the grounding studs
- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

Power Sockets

The Alpine 3802 switch supports up to two AC power supplies. Each power supply has its own power socket. When a second power supply is installed, both provide a redundant, load-shared power supply to the Alpine 3802 switch. If one of the power supplies fails, the second power supply provides all power and ensures uninterrupted network operation.

NOTE

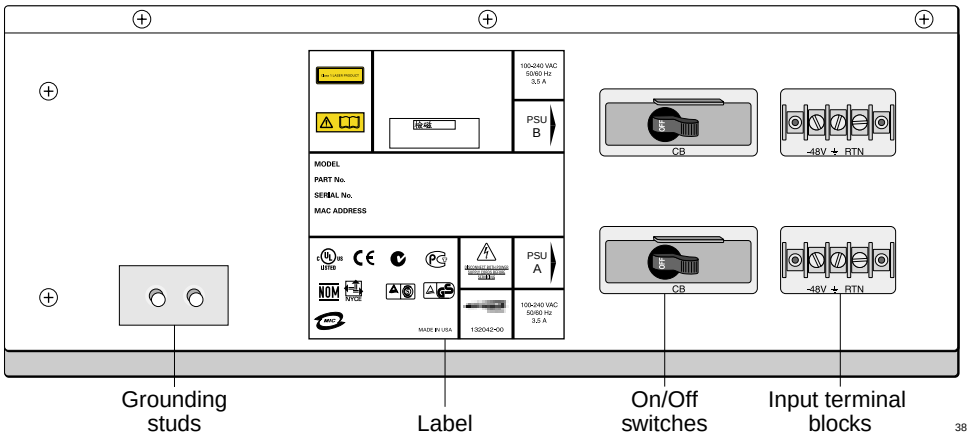
Do not attempt to fix a failed power supply; power supplies are not user removable. Alpine 3802 switch power supplies must be installed or removed by trained service personnel only. Contact Extreme Networks Customer Support if you experience problems.

If you have one power supply installed in the Alpine 3802, it must be installed in the lower power supply tray (PSU A).

Alpine 3802 DC Rear View

For centralized DC power connections, install only in a restricted access area.

Figure 57: Rear view of the Alpine 3802 switch with dual DC power supplies



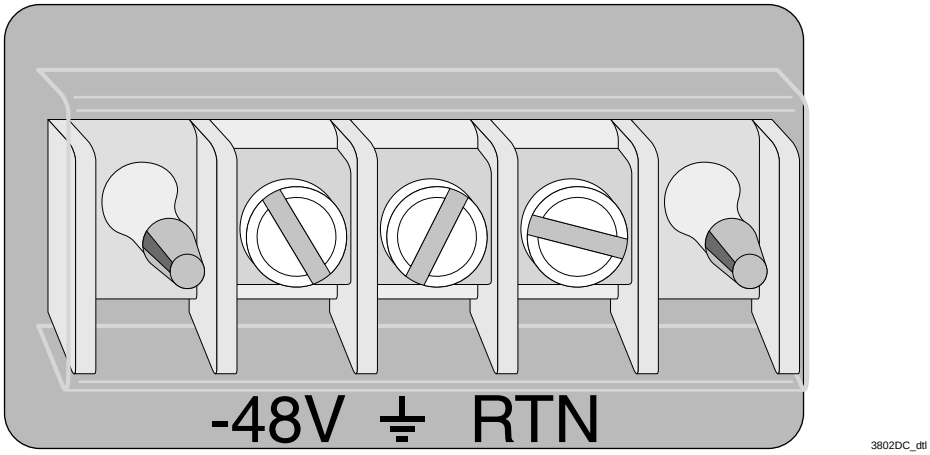
The rear view of the Alpine 3802 DC switch provides:

- Access to the grounding studs
- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

- On / Off switches
- Input terminal blocks

Figure 58 shows a close-up view of the Alpine 3802 DC connector

Figure 58: View of the DC connector on the Alpine 3802 DC switch



On/Off Switch

The Alpine 3802 switch supports two DC power supplies, and each power supply has its own on / off switch. If you have both power supplies powered on, both provide a redundant, load-shared power supply to the Alpine 3802 switch. If one of the power supplies fails, the second power supply provides all power and ensures uninterrupted network operation. Connect each power supply to different, independent power sources. If a power source fails, it will only affect the switch power supply to which it is connected. If all switch power supplies are connected to a single power source, the entire switch is vulnerable to a power source failure.

NOTE

Do not attempt to fix a failed power supply; power supplies are not user removable. Alpine 3802 switch power supplies must be installed or removed by trained service personnel only. Contact Extreme Networks Customer Support if you experience problems.

If you require DC power, you must have two DC power supplies installed in the chassis.

Alpine 3802 Software Enhancements

The Alpine 3802 incorporates software enhancements and new commands to assist you in troubleshooting switch errors and configuring the switch. This section describes the added software features.

New Error Messages

If you insert a module into the Alpine 3802 that is not allowed in a particular slot, the switch logs the error to the syslog. For example, if you insert a GM-WDMi module in slot 3, the switch logs an error.

New Command

The Alpine 3802 has three modes of switch operation. You can use the `configure switch {auto | extended | standard}` command to configure the switch to operate in a specific mode. By default, the switch operates in auto mode.

The three modes of switch operation are:

- Extended mode—Slot 1 supports all existing Alpine modules: Alpine Ethernet I/O modules (green stripe) and Alpine Access I/O modules (silver stripe). Slots 2 and 3 support only Alpine Access I/O modules (silver stripe).

  The Extended Mode LED lights when the switch is in extended mode.

- Standard mode—In standard mode, only slots 1 and 2 are enabled. Slot 3 is disabled. Slots 1 and 2 support all existing Alpine I/O modules: Alpine Ethernet I/O modules (green stripe) and Alpine Access I/O modules (silver stripe).

  The Standard Mode LED lights when the switch is in standard mode.

- Auto mode—In auto mode, the switch determines if it is in standard or extended mode depending on the type of modules installed in the chassis or the slot preconfigurations. If an Alpine I/O module with a green stripe (for example, an FM-32Ti module) is installed or preconfigured in slot 2, the switch operates in standard mode. If an Alpine I/O module with a silver stripe (for example, a WM-4Ti module) is installed or preconfigured in slots 2 or 3, the switch operates in extended mode.

Updated Commands

Two commands have been updated to reflect Alpine 3802 specific information and configurations: `show switch` and `show version`.

Use the `show switch` command to display the current switch information, including the mode of switch operation.

Use the `show version` command to display hardware and software versions currently running on the switch as well as the riser card serial number (the riser card supports connection to the I/O slots). Information about the power supplies is not displayed.

Installing the Chassis

The Alpine 3800 series chassis fits in standard 19-inch (48.26 cm) racks. Table 36 displays the height measurements for the Alpine 3800 series chassis.

Table 36: Alpine 3800 chassis height measurements

Switch Model	Height
Alpine 3808	12 U
Alpine 3804	6 U
Alpine 3802	4 U

The Alpine 3808 and Alpine 3804 chassis are shipped with a preinstalled fan tray. For your safety, due to the increased weight of the chassis after components are installed and to prevent damage to the equipment, we strongly recommended that you install the power supply and modules after you mount the chassis in a rack.

The Alpine 3802 chassis is shipped with a preinstalled power supply and fan tray. For your safety, due to the increased weight of the chassis after components are installed and to prevent damage to the equipment, we strongly recommend that you install the I/O modules after you mount the chassis in a rack.

NOTE

Mount the chassis in a rack before installing any switch components.

Rack Installation

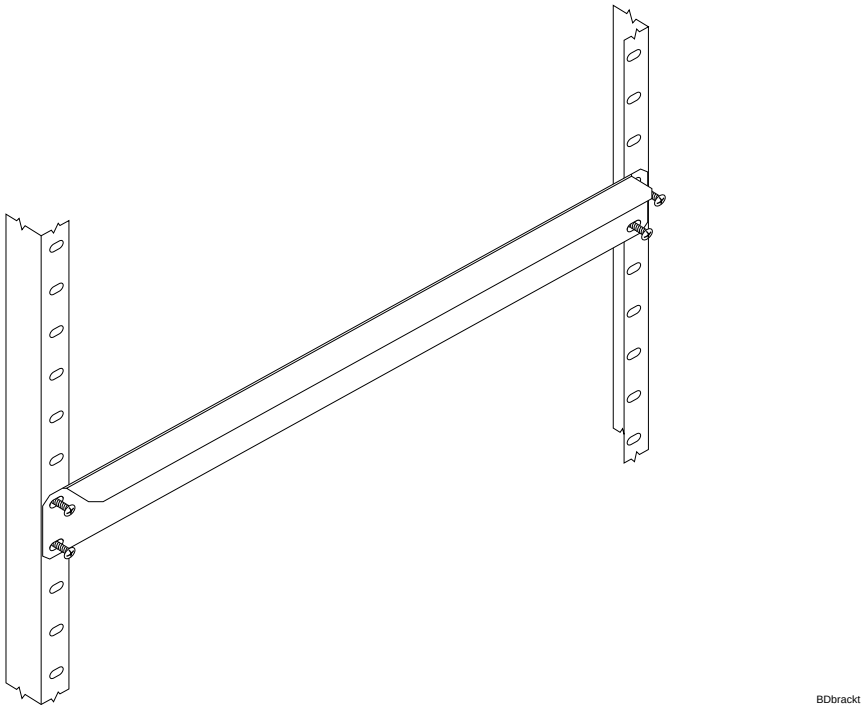
To mount the Alpine 3800 series chassis into a standard 19-inch (48.26 cm) rack, you need the following tools, equipment, and resources:

- Helper bracket (provided)
- A minimum of four appropriate screws to secure the helper bracket (not provided)
- If you have an Alpine 3808 or 3804, a minimum of eight appropriate screws (not provided) to secure the chassis into the rack
- If you have an Alpine 3802, a minimum of four appropriate screws (not provided) to secure the chassis into the rack
- # 1 Phillips screwdriver
- A minimum of two people to help install the chassis into the rack

To mount the chassis into a rack:

1 Mount the helper bracket in the lowest available position in the rack using four appropriate screws (not provided), as shown in Figure 59.

Figure 59: Helper bracket for mounting the Alpine 3800 series chassis



2 Place the box that contains the chassis upright on a secure flat surface with the front of the box facing you.

3 Remove the chassis from the box, and remove the packing material from the chassis.

4 Have a minimum of two people lift and place the empty chassis on the helper bracket and slowly guide the chassis into the rack.

5 While holding the empty chassis, secure it with four or eight suitable screws, depending on the model, as shown in Figure 60, Figure 61, and Figure 62.

6 After you secure the chassis, remove the helper bracket. Store it for future use, for example, if you need to remove the chassis.

Figure 60: The Alpine 3808 chassis requires 8 screws to be securely mounted in a rack

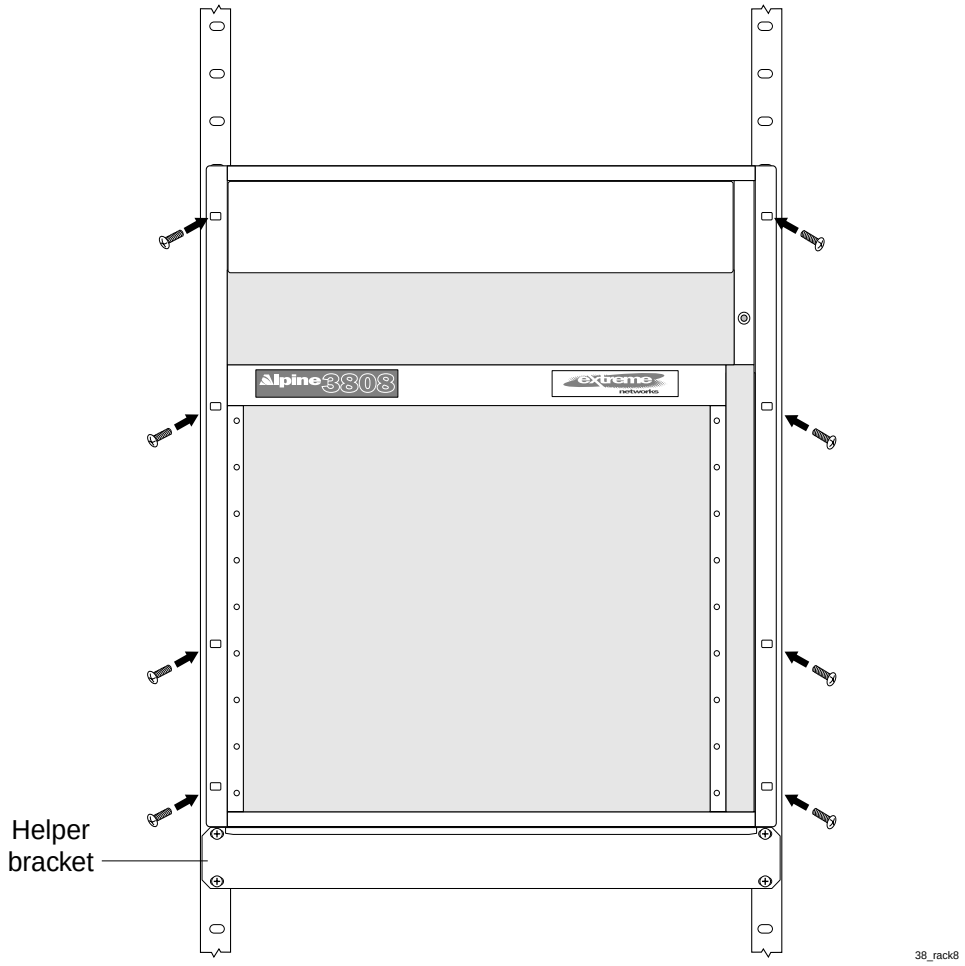


Figure 61: The Alpine 3804 chassis requires 8 screws to be securely mounted in a rack

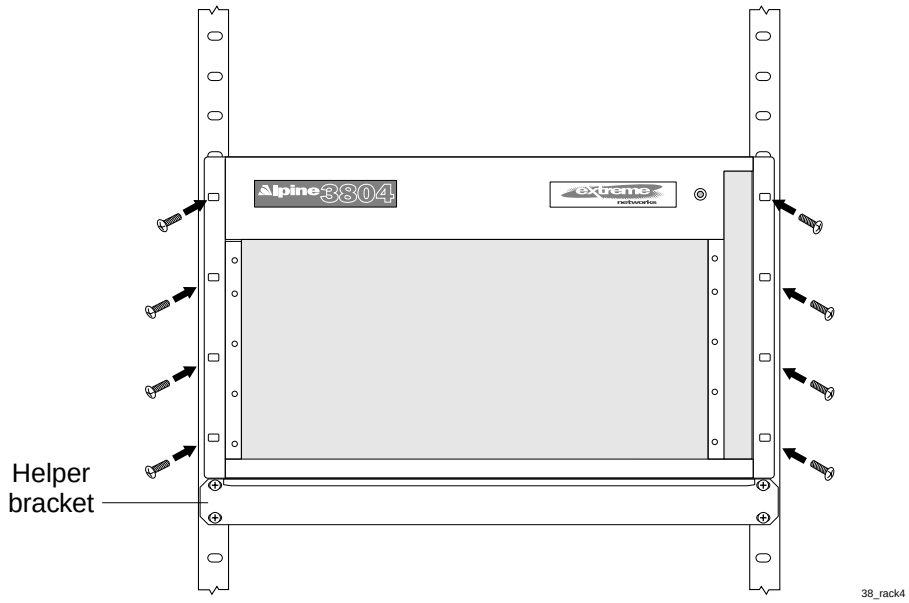
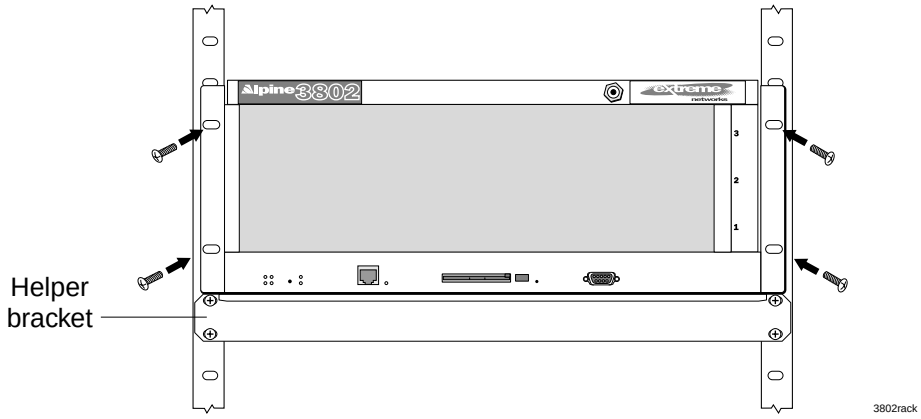


Figure 62: The Alpine 3802 chassis requires 4 screws to be securely mounted in a rack



Grounding the Alpine 3800 Series Chassis

To ground your Alpine 3800 series chassis in accordance with NEBS standards, gather these materials:

- Two zinc-plated steel lockwashers
- Two zinc-plated steel nuts
- One Panduit-style, standard two-hole barrel, copper compression lug
- AWG, high strand-count copper wire cable, appropriate for your chassis
  - 8 AWG for the Alpine 3808
  - 10 AWG for the Alpine 3804
  - 14 AWG for the Alpine 3802

To ground the chassis:

1. Strip 0.5 inch (1.2 cm) of insulation from the appropriate AWG, high strand-count copper wire cable.
2. Insert the cable into the cable lug.

CAUTION

Ensure that no copper is visible between the lug and the cable insulation.

3. Tighten the cable retention screw, using a $^{1}/_{4}$" or $^{5}/_{16}$" flathead screwdriver, to 20 in-lbs of torque.
4. Attach the ground lug, lock washers, and nuts (in that order) to the grounding studs on the rear of the chassis. Tighten the nuts to 125 in-lbs of torque.

Removing the Chassis

This section describes how to remove the Alpine 3800 series chassis from a rack.

To uninstall the Alpine 3800 series chassis from a rack, you need the following tools, equipment, and resources:

- Helper bracket (provided)
- A minimum of four appropriate screws to secure the helper bracket (not provided)

- # 1 Phillips screwdriver
- A minimum of two people to help remove the chassis from the rack

To remove the Alpine 3800 series chassis from a standard 19-inch (48.26 cm) rack:

1. Unplug the power cable from the outlet and then from the switch before you attempt to remove the chassis components and the chassis from the rack.
2. Mount the helper bracket in the rack directly beneath the chassis using four screws that are appropriate for your rack.
3. To reduce weight and prevent possible equipment damage, use a # 1 Phillips screwdriver to remove the:
   - Power supply, SMMi, and I/O modules from the Alpine 3808 and Alpine 3804.
   - I/O modules from the Alpine 3802.

   For information about removing power supplies, see Chapter 8.
   For information about removing the SMMi, see Chapter 9.
   For information about removing I/O modules, see Chapter 10.
4. Unscrew the chassis from the rack.
5. Have a minimum of two people gently remove the chassis from the rack and place it on a secure, flat surface with the front of the chassis facing you.
6. Unscrew the helper bracket and remove it from the rack.

8 Alpine 3800 Series Switch Power Supplies

This chapter describes:

- Installing the Alpine 3808 and the Alpine 3804 AC Power Supply on page 142
- Removing the Alpine 3808 and the Alpine 3804 AC Power Supply on page 145
- Supplying Power to the Alpine 3802 AC Power Supply on page 146
- Installing the Alpine 3808 and the Alpine 3804 DC Power Supply on page 147
- Removing the Alpine 3808 and the Alpine 3804 DC Power Supply on page 151
- Supplying Power to the Alpine 3802 DC Power Supply on page 152

NOTE

Read the information in this chapter thoroughly before you attempt to install, remove, or supply power to any Alpine power supply.

The Alpine 3800 series chassis accommodates two power supplies: AC and DC. If two power supplies are installed in the switch, both installed power supplies must be of the same type. The AC power supplies auto-sense for 110 VAC and 220 VAC power. The DC power supplies require -48 VDC nominal input line voltage. When two power supplies are present, the power is load-shared between the supplies for enhanced longevity.

The power supplies for the Alpine 3808 are inserted into the front of the chassis. The power supplies for the Alpine 3804 are inserted into the lower rear of the chassis. The Alpine 3802 power supplies are preinstalled at the factory and are not user-removable. Table 37 describes the supported power supplies for the Alpine 3800 series switch.

Table 37: Supported power supplies for the Alpine 3800 series switch

Switch Model	AC Power Supply	DC Power Supply	Hot-swappable
Alpine 3808[1]	Up to two AC power supplies can be installed.	Up to two DC power supplies can be installed.	Yes
Alpine 3804[1]	Up to two AC power supplies can be installed.	Up to two DC power supplies can be installed.	Yes
Alpine 3802[1]	Up to two AC power supplies can be installed.[2]	Two DC power supplies must be installed.[3]	No

1 All installation, maintenance, and removal of a power supply must be done by qualified, trained service personnel only.
2 If you have one AC power supply installed in the Alpine 3802 switch, it must be installed in the lower power supply tray (PSU A).
3 If you require DC power supplies in the Alpine 3802 switch, you must have two DC power supplies installed.

The Alpine 3800 series switch generates SNMP traps for the following events:

- AC power source fails
- Power supply fails
- Power supply is removed

For more information about planning your site and power requirements, see "Meeting Power Requirements" in Chapter 2. For more information about the specifications of the Alpine 3800 series switch power supplies, see Table 83 on page 302.

Power Supply LEDs

Table 38 and Table 39 describe LEDs that pertain to power for the Alpine 3800 series switch.

Table 38: Alpine 3808 and Alpine 3804 power supply LED

LED	Color	Indicates
D/C OK	Green	All DC outputs are operational
	Off	One or more DC outputs have failed

Table 39: Alpine 3802 power supply LEDs

LED	Color	Indicates
PSU A, PSU B	Green	Normal operation
	Amber	DC output failure
	Off	PSU not present or not powered

Installing the Alpine 3808 and the Alpine 3804 AC Power Supply

This section describes how to install an AC power supply for either the Alpine 3808 or the Alpine 3804 switch. The Alpine 3802 switch power supply is preinstalled at the factory. The power supplies for the Alpine 3808 switch are inserted into the front of the chassis. The power supplies for the Alpine 3804 switch are inserted into the lower rear of the chassis.

For centralized DC power connections, install only in a restricted access area.

NOTE

Ground the rack, mount the chassis in a rack, and ground the chassis before installing any switch components. For more information about grounding the rack, see "Protective Grounding for the Rack" on

page 52. For more information about grounding the chassis, see "Grounding the Alpine 3800 Series Chassis" on page 138.

You need the following tools and equipment to install the Alpine 3808 and the Alpine 3804 AC power supplies:

- ESD-preventive wrist strap
- # 2 Phillips screwdriver
- AC power supply

To install the Alpine 3808 and the Alpine 3804 AC power supplies:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.
2. If there is a blank faceplate covering the power supply bay, remove it and save it for future use.
3. Ensure that the power supply is oriented correctly for either the Alpine 3808 or Alpine 3804 using the text on the front of the power supply, that the safety latch is in the "remove" position, and that the ejector / injector lever is open, as shown in Figure 63 and Figure 64.

CAUTION

When you insert a power supply, use one hand to support the power supply from the bottom and the other hand to hold the central handle on the front of the power supply. Do not use just the ejector/injector lever to insert a power supply.

4. Use the central handle to guide the power supply into the power supply bay while supporting the supply from the bottom with your other hand.

Figure 63: AC power supply for the Alpine 3808 switch

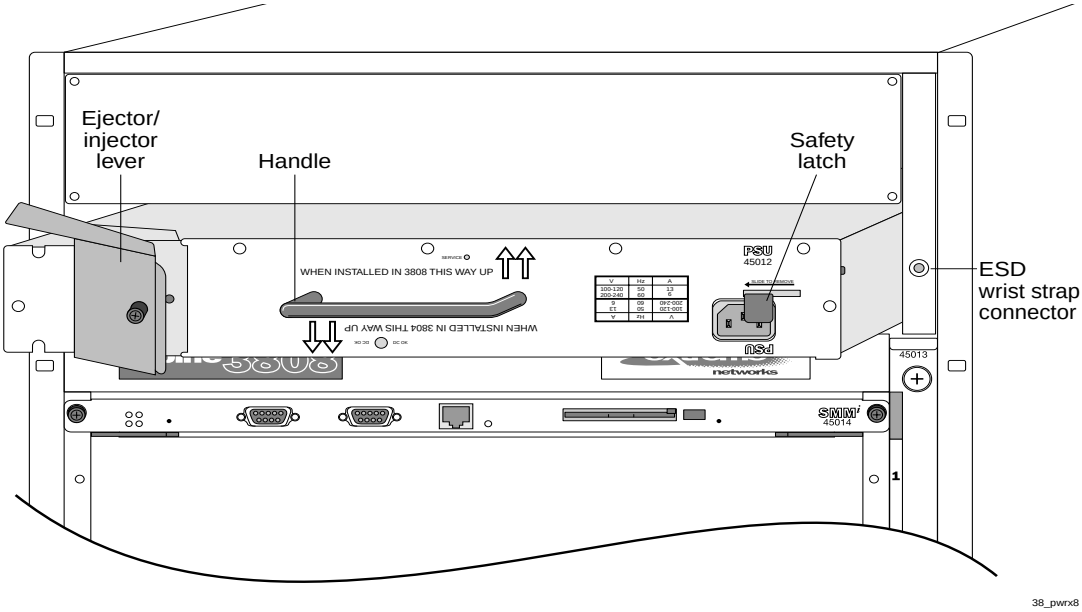
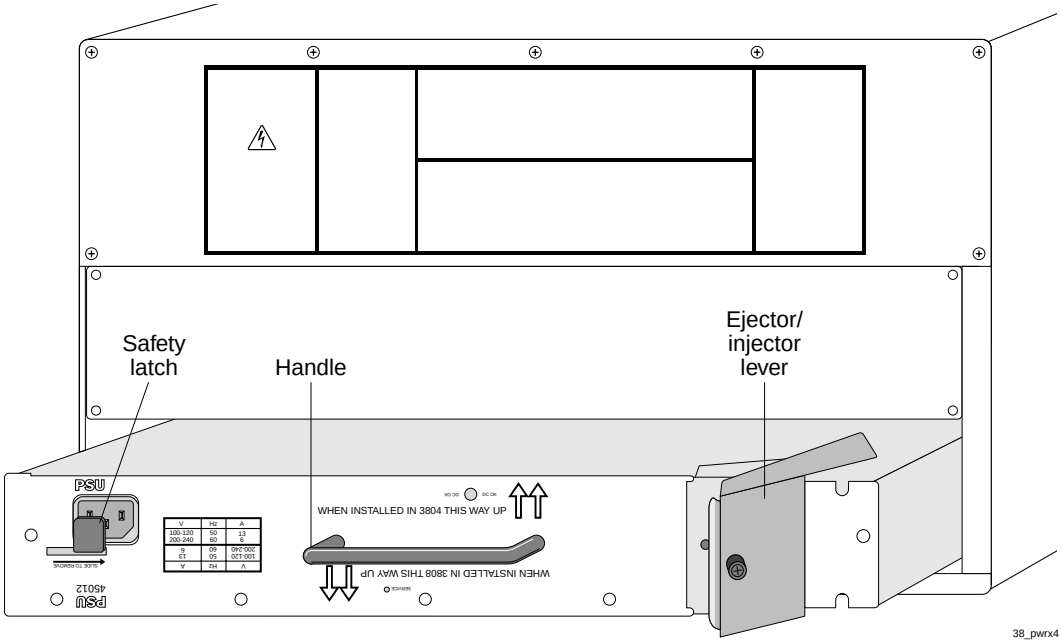


Figure 64: AC power supply for the Alpine 3804 switch



CAUTION

When you install the power supply, open the ejector/injector lever and do not slam the power supply into the backplane. Failure to do so may cause damage and possibly require the return of the chassis.

5 Place both hands on each side of the power supply to slowly and evenly slide the power supply into the bay. During the last inch of insertion into the chassis, place one hand on the central handle to steady the power supply and use your other hand to gently push the ejector/injector lever towards the power supply to engage the power supply backplane connectors.

6 Secure the power supply by tightening the screw on the ejector/injector lever with a #2 Phillips screwdriver.

7 To uncover the power connector, slide the safety latch to the right.

8 To turn on power to the system, connect the power cable to the power supply and then to the wall outlet.

CAUTION

The power supply cannot be installed if an AC power cable is plugged in. You can damage the chassis and power supply if you attempt to install a power supply with an AC power cable connected.

9 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To install an additional power supply, repeat steps 1 through 8.

Verifying a Successful Installation

After you supply power to the Alpine switch, the switch performs a power-on self test (POST).

During the POST, all ports are temporarily disabled, the packet LED is off, the power LED is on, and the MGMT LED flashes. The MGMT LED flashes until the switch successfully passes the POST.

If the switch passes the POST, the MGMT LED blinks at a slow rate (one blink per second). If the switch fails the POST, the MGMT LED shows a solid yellow light.

NOTE

See Chapter 9, "Alpine 3800 Series Switch Management Module" for more information about switch management module LED activity and Chapter 10, "Alpine 3800 Series I/O Modules" for more information about I/O module LED activity.

Removing the Alpine 3808 and the Alpine 3804 AC Power Supply

You need the following tools and equipment to remove the Alpine 3808 and the Alpine 3804 AC power supplies:

- ESD-preventive wrist strap
- # 2 Phillips screwdriver
- Replacement AC power supply

To remove an AC power supply from the Alpine 3808 or the Alpine 3804 switch:

1. Remove the AC power cable from the wall outlet and then from the power supply.
2. Attach the ESD strap that is provided to your wrist and connect the metal end of the ESD strap to the ground receptacle that is located on the top-right corner of the switch front panel.
3. Slide the safety latch to the left to cover the power connector.

   CAUTION

   Ensure that the latch covers the AC power connector. The power supply cannot be removed unless the connector is covered.

4. Use a #2 Phillips screwdriver to unscrew the screw on the ejector/injector lever then pull the ejector/injector lever towards you to disengage the power supply connectors from the backplane. Hold on to the central handle to steady the power supply.

   CAUTION

   When you remove a power supply, use one hand to support the power supply from the bottom and the other hand to hold the central handle on the front of the power supply. Do not use just the ejector/injector lever to remove a power supply.

5. Use one hand on the central handle to slowly pull the power supply towards you. Place your other hand beneath the power supply to support it as you pull it out of the chassis.

6 If you are going to install a replacement power supply, follow the installation steps on page 142.

7 If there is a problem with the power supply that you removed, contact Extreme Networks for assistance. Do not attempt to fix a faulty power supply. Personal injury to yourself or others may occur.

8 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Supplying Power to the Alpine 3802 AC Power Supply

The Alpine 3802 switch supports up to two AC power supplies that come preinstalled from the factory.

NOTE

Ground the rack, mount the chassis in a rack, and ground the chassis before installing any switch components. For more information about grounding the rack, see "Protective Grounding for the Rack" on page 52. For more information about grounding the chassis, see "Grounding the Alpine 3800 Series Chassis" on page 138.

To turn on power to the system, connect the power cable to the power supply and then to the wall outlet.

In the event of a power supply failure, please contact Extreme Networks about servicing and replacing your power supply.

NOTE

Alpine 3802 power supplies must be removed and replaced by personnel that have been trained by Extreme Networks.

Verifying a Successful Installation

After you supply power to the Alpine switch, the switch performs a power-on self test (POST).

During the POST, all ports are temporarily disabled, the packet LED is off, the power LED is on, and the MGMT LED flashes. The MGMT LED flashes until the switch successfully passes the POST.

If the switch passes the POST, the MGMT LED blinks at a slow rate (one blink per second). If the switch fails the POST, the MGMT LED shows a solid yellow light.

NOTE

See Chapter 9, "Alpine 3800 Series Switch Management Module" for more information about switch management module LED activity and Chapter 10, "Alpine 3800 Series I/O Modules" for more information about I/O module LED activity.

Installing the Alpine 3808 and the Alpine 3804 DC Power Supply

This section describes the steps to successfully install and power your Alpine 3808 or Alpine 3804 DC power supply:

- Selecting the cabling
- Installing the DC power supply
- Attaching the cabling and supplying power
- Verifying a successful installation

For centralized DC power connections, install only in a restricted access area.

Selecting the Cabling

Use the following guidelines when selecting cabling for the DC power supplies:

- Each DC power supply requires 30 A (Alpine 3808) or 16.5 A (Alpine 3804) at -48 VDC nominal (or equivalent power between -40 and -70 VDC).
- For DC power and ground cables, use 8 AWG, high-strand count copper wire cable (Alpine 3808) or 10 AWG, high-strand-count copper wire cable (Alpine 3804).

Use power cables with the specifications outlined in Table 40.

Table 40: Source DC power specifications for the Alpine 3808 and the Alpine 3804

Switch	Characteristic	Specification
Alpine 3808	DC power cable size	8 AWG, high-strand count copper wire
	DC power cable lug	Panduit copper, standard barrel, 2-hole lug—Type LDC (Panduit part number: LCD4-14A-L; Thomas & Betts part number: LCN4-14).
	Power	-40 - -70 VDC 30 A
Alpine 3804	DC power cable size	10 AWG, high-strand count copper wire
	DC power cable lug	Panduit copper, standard barrel, 2-hole lug—Type LDC (Panduit part number: LCD4-14A-L; Thomas & Betts part number: LCN4-14).
	Power	-40 - -70 VDC 16.5 A

Installing the Power Supply

This section describes how to install a DC power supply for both the Alpine 3808 switch and the Alpine 3804 switch. The Alpine 3802 switch comes with DC power supplies that are preinstalled at the factory; however, you must attach the cabling to the DC power supplies. See “Supplying Power to the Alpine 3802 DC Power Supply” on page 152 for more information.

NOTE

Ground the rack, mount the chassis in a rack, and ground the chassis before installing any switch components. For more information about grounding the rack, see “Protective Grounding for the Rack” on

page 52. For more information about grounding the chassis, see "Grounding the Alpine 3800 Series Chassis" on page 138.

You need the following tools and equipment to install the Alpine 3808 and the Alpine 3804 DC power supplies:

- ESD-preventive wrist strap
- # 2 Phillips screwdriver
- DC power supply

To install the Alpine 3808 or the Alpine 3804 DC power supplies:

1 Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.

2 If there is a blank faceplate covering the power supply bay, remove it and save it for future use.

3 Ensure that the power supply is oriented correctly for either the Alpine 3808 or Alpine 3804 using the text on the front of the power supply, and ensure that the ejector/injector lever is open, the safety latch is in the "remove" position, and the breaker is in the "off" position, as shown in Figure 65 and Figure 66.

Figure 65: DC power supply for the Alpine 3808 switch

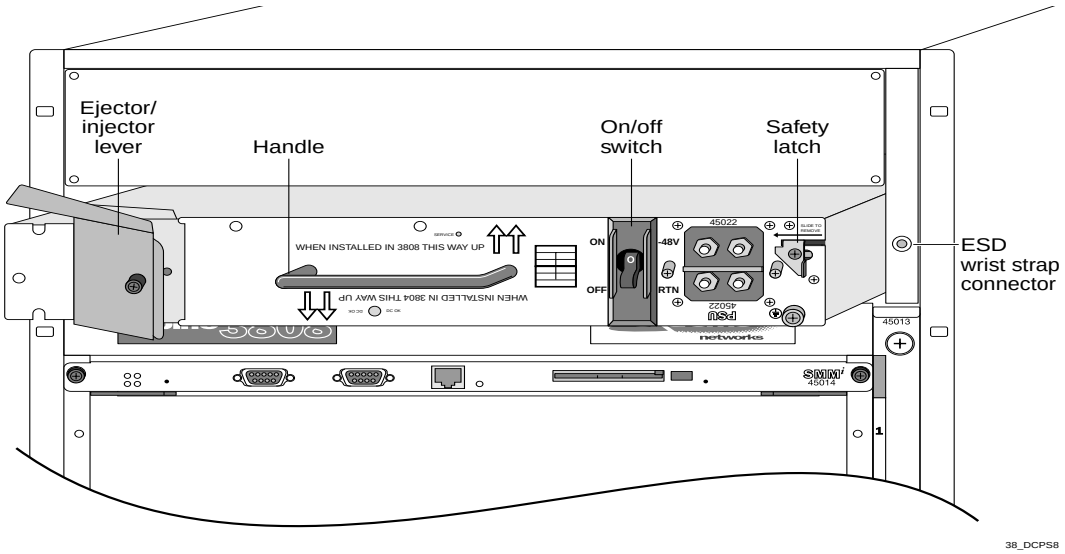
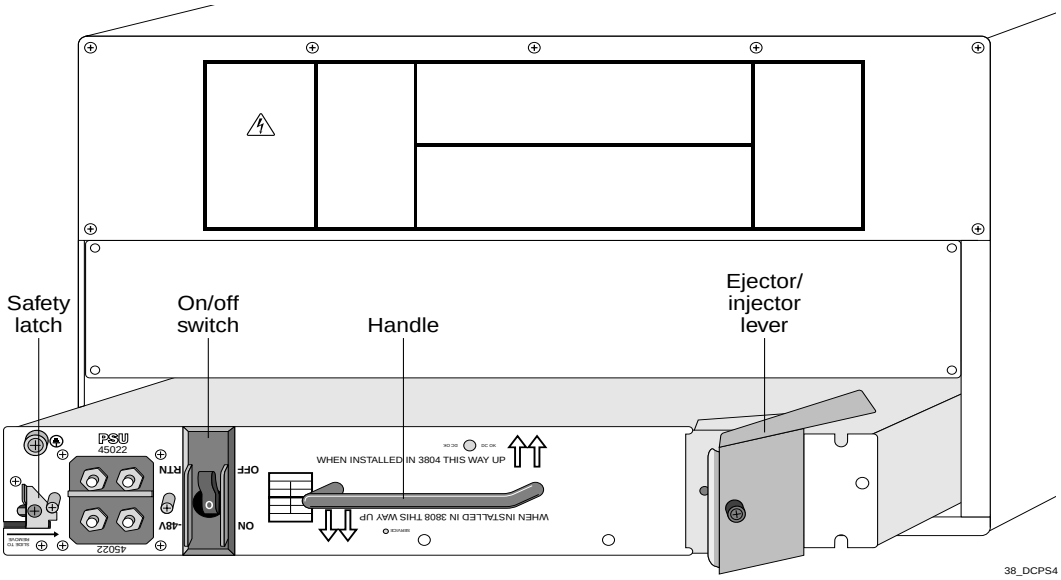


Figure 66: DC power supply for the Alpine 3804 switch



CAUTION

When you insert a power supply, use one hand to support the power supply from the bottom and the other hand to hold the central handle on the front of the power supply. Do not use just the ejector/injector lever to insert a power supply.

4 Use the central handle to guide the power supply into the bay while supporting the supply from the bottom with your other hand.

CAUTION

Do not slam the power supply into the backplane. This or other excessive force will cause damage and possibly require the return of the chassis.

5 Place both hands on each side of the power supply to slowly and evenly slide the power supply into the bay. During the last inch of insertion into the chassis, place one hand on the central handle to steady the power supply and use your other hand to gently push the ejector/injector lever towards the power supply to engage the power supply backplane connectors.

6 Secure the power supply by tightening the screw on the ejector/injector lever using a #2 Phillips screwdriver.

7 Slide the locking safety latch away from the “remove” position.

8 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To install an additional power supply, repeat steps 1 through 7.

Attaching the Cabling and Supplying Power

After you install the power supply into the chassis, you need to attach the cabling so you can supply power to chassis. To attach the cable to the lugs, and then to the DC power supply, perform the following steps:

1 Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.

2 Remove the plexiglas cover that shields the power connection on the power supply.

3 Strip 0.5 inches of insulation from the appropriate AWG, high strand-count copper cable.

4 Insert the cable into the DC ground and power cable lugs on the power supply, as shown in Figure 67 and Figure 68.

Figure 67: Alpine 3808 DC power supply with cables

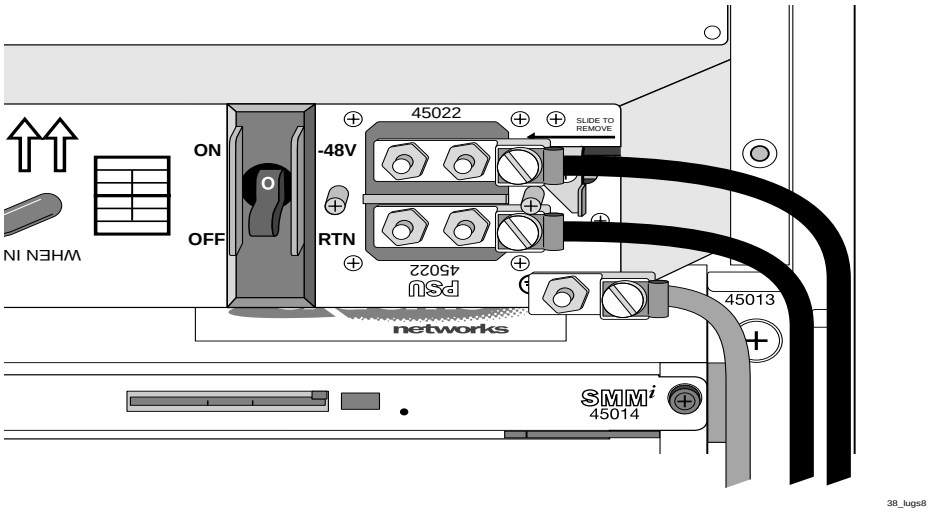
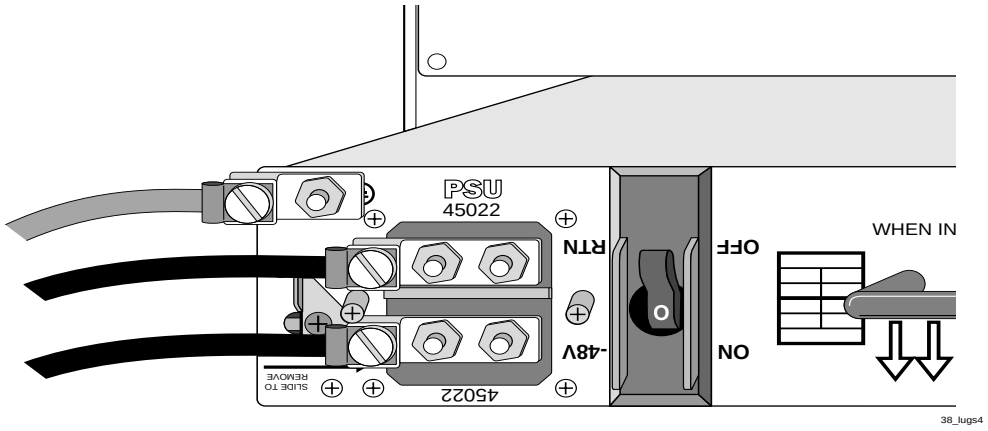


Figure 68: Alpine 3804 DC power supply with cables

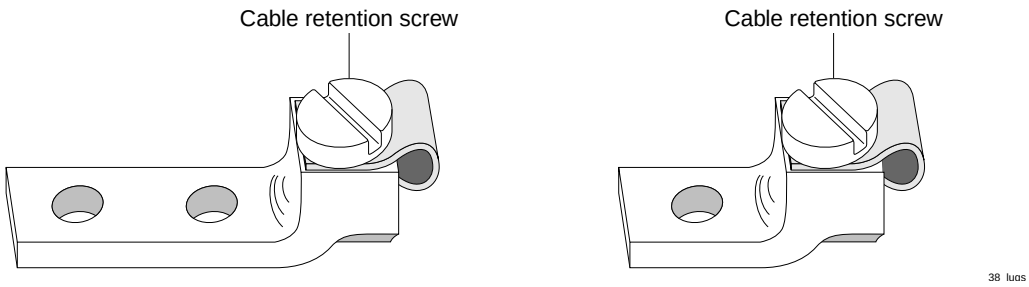


CAUTION

Ensure that no copper is visible between the lug and the cable insulation.

5 Tighten the cable retention screw, using a $^{1}/_{4}$" or $^{5}/_{16}$" flathead screwdriver, to 20 in-lbs of torque. The cable retention screw is shown in Figure 69.

Figure 69: 2-stud -48 VDC and RTN lug, and 1-stud ground lug



6 Replace the plexiglas cover.

7 Turn on the DC supply at both the wall breaker and at the power supply breaker.

8 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Verifying a Successful Installation

After you supply power to the Alpine switch, the switch performs a power-on self test (POST).

During the POST, all ports are temporarily disabled, the packet LED is off, the power LED is on, and the MGMT LED flashes. The MGMT LED flashes until the switch successfully passes the POST.

If the switch passes the POST, the MGMT LED blinks at a slow rate (one blink per second). If the switch fails the POST, the MGMT LED shows a solid yellow light.

NOTE

See Chapter 9, "Alpine 3800 Series Switch Management Module" for more information about switch management module LED activity and Chapter 10, "Alpine 3800 Series I/O Modules" for more information about I/O module LED activity.

Removing the Alpine 3808 and the Alpine 3804 DC Power Supply

You need the following tools and equipment to remove the Alpine 3808 and the Alpine 3804 DC power supplies:

- ESD-preventive wrist strap
- # 2 Phillips screwdriver
- Replacement DC power supply

To remove a DC power supply from the Alpine 3808 or the Alpine 3804 switch:

1 Turn off the DC supply at both the source breaker and at the power supply breaker.

2 Attach the ESD strap that is provided to your wrist and connect the metal end of the ESD strap to the ground receptacle that is located on the top-right corner of the switch front panel.

3 Remove the plexiglas cover that shields the power connection on the power supply.

4 Remove the DC power and ground cables from the power supply.

5 Slide the locking safety latch on the power supply in the direction marked “remove.”

CAUTION

Ensure that the latch is in the remove position. You cannot remove the power supply unless the latch is in the remove position.

6 Use a #2 Phillips screwdriver to unscrew the screw on the ejector/injector lever then pull the ejector/injector lever towards you to disengage the power supply connections from the backplane. Hold on to the central handle to steady the power supply.

CAUTION

When you remove a power supply, use one hand to support the power supply from the bottom and the other hand to hold the central handle on the front of the power supply. Do not use just the ejector/injector lever to remove a power supply.

7 Use one hand on the central handle to slowly pull the power supply towards you. Place your other hand beneath the power supply to support it as you pull it out of the chassis.

8 If you are going to install a replacement power supply, follow the installation steps on page 147.

9 If there is a problem with the power supply that you removed, contact Extreme Networks for assistance. Do not attempt to fix a faulty power supply. Personal injury to yourself or others may occur.

10 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Supplying Power to the Alpine 3802 DC Power Supply

The Alpine 3802 switch supports two DC power supplies that come preinstalled from the factory. This section describes the steps to successfully power your Alpine 3802 DC power supplies:

- Selecting the cabling
- Attaching the cabling and supplying power
- Verifying a successful installation

For centralized DC power connections, install only in a restricted access area.

NOTE

Ground the rack, mount the chassis in a rack, and ground the chassis before supplying power to the power supplies. For more information about grounding the rack, see “Protective Grounding for the Rack” on page 52. For more information about grounding the chassis, see “Grounding the Alpine 3800 Series Chassis” on page 138.

In the event of a power supply failure, please contact Extreme Networks about servicing and replacing your power supply.

NOTE

Alpine 3802 power supplies must be removed and replaced by personnel that have been trained by Extreme Networks and in accordance with all local and national electrical codes.

Selecting the Cabling

Use the following guidelines when selecting cabling for the DC power supplies:

- Each DC power supply requires 6.5 A at -48 VDC nominal (or equivalent power between -40 and -70 VDC).
- For DC power and ground cables, use 14 AWG, high strand-count copper wire cable .

Use power cables with the specifications outlined in Table 41.

Table 41: Source DC power specifications for the Alpine 3802

Characteristic	Specification
DC power cable size	14 AWG, high-strand count copper wire
Power	-40 - -70 VDC 7.5 A max

Attaching the Cabling and Supplying Power

After you receive your Alpine 3802, you need to attach the cabling so you can supply power to the chassis. To attach the cable to the lugs, and then to the DC power supply, perform the following steps:

1. Attach the ESD strap that is provided to your wrist and connect the metal end of the ESD strap to the ground receptacle that is located on the top-right corner of the switch front panel.
2. Remove the plexiglas cover that shields the power connection on the power supply.
3. Strip 0.5 inches of insulation from the appropriate AWG, high strand-count copper cable.
4. Insert the cable into the DC ground and power cable lugs on the power supply.

   CAUTION

   Ensure that no copper is visible between the lug and the cable insulation.

5. Tighten the cable retention screw, using a # 2 phillips screwdriver, to a maximum of 10 in-lbs (1.2 Nm) of torque.
6. Replace the plexiglas cover.
7. Turn on the DC supply at both the wall breaker and at the power supply breaker.
8. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Verifying a Successful Installation

After you supply power to the Alpine switch, the switch performs a power-on self test (POST).

During the POST, all ports are temporarily disabled, the packet LED is off, the power LED is on, and the MGMT LED flashes. The MGMT LED flashes until the switch successfully passes the POST.

If the switch passes the POST, the MGMT LED blinks at a slow rate (one blink per second). If the switch fails the POST, the MGMT LED shows a solid yellow light.

NOTE

See Chapter 9, "Alpine 3800 Series Switch Management Module" for more information about switch management module LED activity and Chapter 10, "Alpine 3800 Series I/O Modules" for more information about I/O module LED activity.

9 Alpine 3800 Series Switch Management Module

This chapter describes:

- Installing SMMi Modules on page 157
- Removing SMMi Modules on page 159

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove the Alpine Switch Management Module (SMMi).

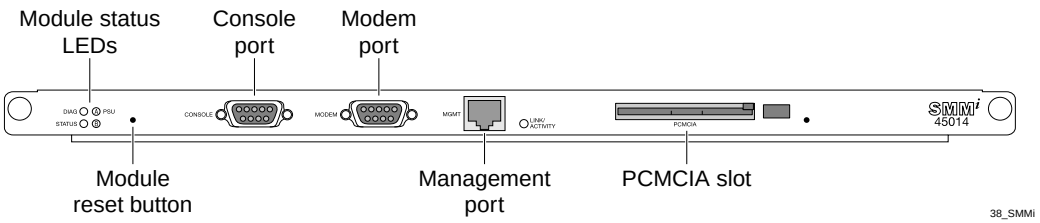
The Switch Management Module (SMMi) is responsible for upper-layer protocol processing and switch management functions in the Alpine 3808 and Alpine 3804 chassis. The SMMi can store two ExtremeWare software images (version 6.0 or later) and two switch configurations.

NOTE

The Alpine 3802 switch does not require a separate Switch Management Module. All upper-layer protocol processing and switch management functions are part of the integrated Switch Management Module that is located in the chassis.

Figure 70 shows the SMMi.

Figure 70: Switch Management Module (SMMi)



The SMMi module consists of a printed circuit board mounted on a metal panel that acts as the insertion vehicle in an Alpine 3808 and Alpine 3804 chassis. The module carrier also includes ejector/injector levers and captive retaining screws at each end of the module front panel.

The SMMi has the following out-of-band management ports:

- Console port—Used to connect a terminal and perform local management.

- Management port—Used to connect an Ethernet cable directly from your laptop into the management port to view and locally manage the switch configurations.
- Modem port —Used to connect a modem for remote access to the CLI.
- PCMCIA slot—Reserved for future use.

See “Management Ports” in Chapter 1 for more information about management ports, and for more information about Alpine SMMi module specifications, see Appendix C, “Module Technical Specifications.”

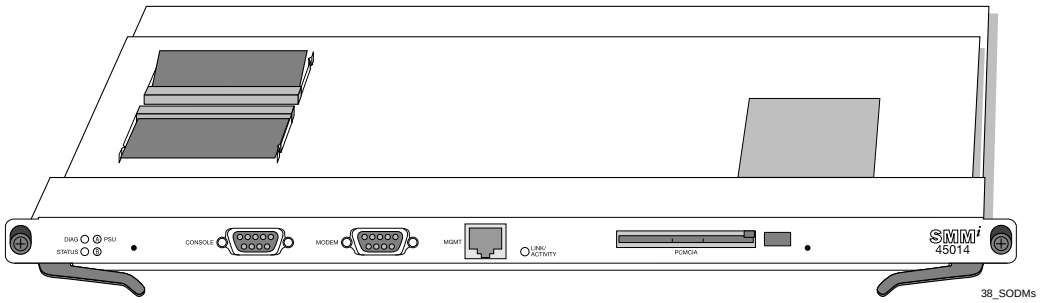
SMMi Memory

The SMMi has two 144-pin SODIMM sockets, and ships with two 128 MB SODRAM modules installed, as shown in Figure 71.

NOTE

The SMMi supports only the SODIMMs that are supplied by Extreme Networks.

Figure 71: SMMi SODIMM sockets



NOTE

See “Adding SODIMMs to the SMMi Module” on page 158 and “Removing SODIMMs from the SMMi Module” on page 159 for more details on how to add and remove SODIMMs.

SMMi LEDs

Table 42 describes the LED activity on the SMMi.

Table 42: SMMi LEDs

LED	Color	Indicates
DIAG	Green blinking	Power-on Self Test (POST) is running
	Off	Normal operation
STATUS	Green blinking	Normal operation
	Yellow blinking	Critical error, fan failure or over temperature
	Off	Unit powered down
PSU A	Green	PSU is OK
PSU B	Amber	DC output failure
	Off	PSU not present or not powered

Installing SMMi Modules

You can insert the SMMi module at any time, without causing disruption of network services.

You need the following tools and equipment to install the SMMi module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- SMMi module

To install the SMMi:

1 Locate the top, unnumbered slot of the chassis. This is where you install the SMMi.

CAUTION

You can install the SMMi only in the designated, top (orange) slot of the Alpine 3808 or 3804 chassis. The SMMi does not fit in any other chassis slots. Forceful insertion can damage the module.

2 Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.

3 Remove the blank faceplate from the slot to make room for the module, if applicable.

NOTE

Any unoccupied module slot in the chassis should have a blank faceplate installed to ensure satisfactory protection from EMI and to guarantee adequate airflow through the chassis.

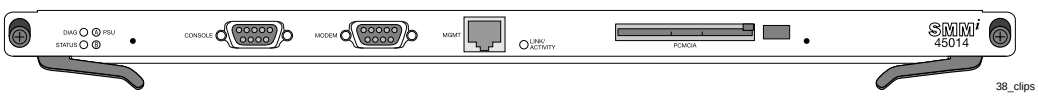
4 Grasp the module by its front panel with one hand, and place your other hand under the edge of the metal panel. Check the connectors for dust and packing materials.

CAUTION

To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the printed circuit board (PCB) or pins on any of the connectors.

5 Ensure that the SMMi is horizontal with the module name to the right, the PCB on top, and that the ejector/injector levers are extended, as shown in Figure 72.

Figure 72: SMMi with open ejector/injector levers



a Slide the module into the top slot of the chassis, until it makes contact with the backplane.

NOTE

Use the metal panel, not the PCB, to guide the SMMi.

As the module begins to seat in the chassis, the ejector/injector levers begin to close.

b To close the ejector/injector levers, use both hands simultaneously to push the levers toward the center of the module.

c To secure the module, tighten the two captive screws using a #2 Phillips screwdriver.

NOTE

Tighten the screws of this module before *you insert additional modules. Otherwise, you might unseat modules that you have not secured.*

6 Store the module packaging for future use.

7 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Verifying the SMMi Module Installation

After you install the SMMi module, verify that it is working correctly. Check the LEDs on the front panel of the SMMi module. If the SMMi module is operating normally, the front-panel LED indicators should appear as follows:

- STATUS LED—green blinking
- DIAG LED—off
- PSU A, B, or both LEDs—green

For more information about SMMi module LED activity, see “SMMi LEDs” on page 156.

Adding SODIMMs to the SMMi Module

The SMMi supports only SODIMMs from Extreme Networks.

To add a SODIMM to the SMMi:

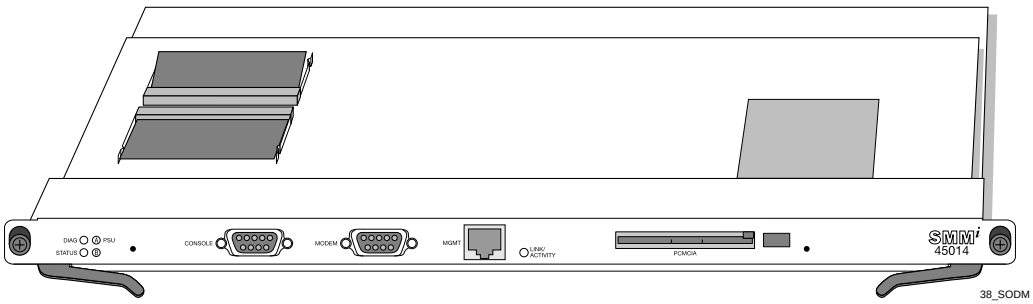
1 Attach an ESD strap to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.

2 Locate the SODIMM sockets on the SMMi.

3 Position the SODIMM in the socket by ensuring that the gold fingers of the SODIMM slip into the connector and the keying notches align.

4 Secure the SODIMM by pressing down firmly until it is locked into the socket and the ejector locks rotate into position, as shown in Figure 73.

Figure 73: Adding a SODIMM to the SMMi



Removing SODIMMs from the SMMi Module

To remove a SODIMM:

1. Attach an ESD strap to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.
2. Disengage the SODIMM by pulling out on the ejector locks located on either side of the SODIMM.
3. Rotate the SODIMM out of the socket.

Removing SMMi Modules

All Alpine 3800 series modules (SMMi and I/O modules) are hot-swappable. You do not need to power off the system to remove a module.

You need the following tools and equipment to remove an SMMi module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement SMMi module

To remove an SMMi module:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.
2. Use a #2 Phillips screwdriver to unscrew the two captive screws.
3. Simultaneously rotate the ejector/injector levers away from the center of the module to disengage the module from the backplane.
   a. Grasp the module front panel with one hand, and place your other hand under the metal panel to support the module.

   CAUTION

   To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

   b. Slide the module out of the chassis and place it immediately into an antistatic sack to protect it from ESD damage and to prevent dust from collecting on the module's connectors.
4. To install a replacement SMMi, follow the SMMi module installation procedure on page 157.
5. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

10 Alpine 3800 Series I/O Modules

This chapter describes:

- Configuring I/O Modules on page 161
- Installing I/O Modules on page 177
- Removing I/O Modules on page 179

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any Alpine I/O modules.

Alpine I/O modules consist of a printed circuit board mounted on a metal panel that acts as the insertion vehicle in an Alpine 3800 series switch. The module carrier also includes ejector/injector levers and captive retaining screws at each end of the module front panel.

For more information about Alpine I/O module specifications, see Appendix C, "Module Technical Specifications."

Configuring I/O Modules

No configuration information is stored on the I/O modules; configuration information is stored on the SMMi for the Alpine 3808 and 3804 chassis and the integrated Switch Management Module in the Alpine 3802 chassis.

NOTE

There is a slight difference in appearance between Alpine I/O modules. Alpine Ethernet I/O modules have a green stripe along the side of the module. Alpine Access I/O modules have a silver stripe along the side of the module.

When the Alpine 3800 series switch is powered on, ExtremeWare generates a default configuration for any slots with I/O modules. The default configuration allows the I/O module ports to participate in the VLAN named *default*. The default configuration for the I/O module is not preserved unless you explicitly save the information to nonvolatile RAM (NVRAM).

You can configure parameters of the I/O module after it is installed or you can pre-configure a slot for a certain type of module and configuration. The pre-configured information is applied to the module after it is inserted. If you pre-configure a slot for a specific module type, and then insert a different type of module, the module reverts to its default configuration.

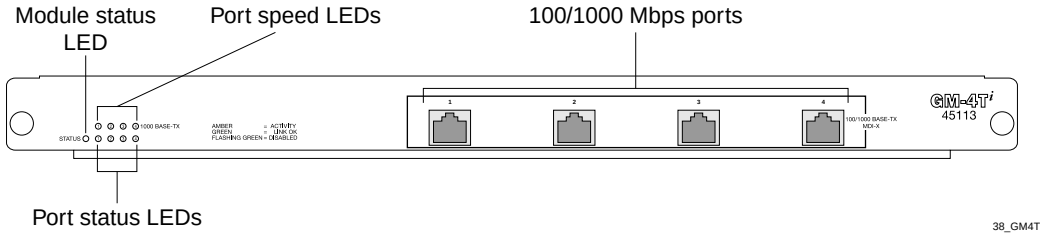
NOTE

See the ExtremeWare Software User Guide *and the* ExtremeWare Command Reference Guide *for more information about configuring I/O modules.*

GM-4Ti Module

Figure 74 shows the GM-4Ti module.

Figure 74: GM-4Ti module



The GM-4Ti module has four Gigabit Ethernet ports. All Gigabit Ethernet ports on this module use standard RJ-45 connectors and autonegotiate for 100BASE-TX or 1000BASE-T.

The default configuration of the GM-4Ti module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in autonegotiation mode.

LEDs

The GM-4Ti module has the following LEDs:

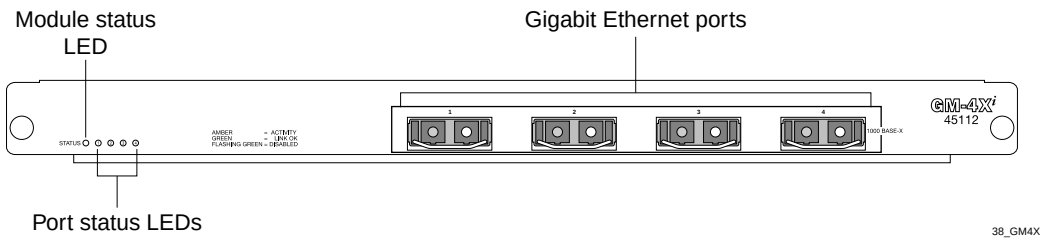
- Module status
- Port status
- Port speed

For information about the LEDs and their activity on the GM-4Ti module, see “I/O Module LEDs” on page 176.

GM-4Xi Module

Figure 75 shows the GM-4Xi module.

Figure 75: GM-4Xi module



The GM-4Xi module has four GBIC-based Gigabit Ethernet ports. All Gigabit Ethernet ports on this module use standard GBIC connectors and support 1000BASE-SX, 1000BASE-LX, and 1000BASE-LX70.

The default configuration of the GM-4Xi module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in autonegotiation mode.

GBIC Ports

The GM-4Xi module supports the following GBICs:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100 GBIC
- UTP GBIC

GBIC Media Types and Distances. Table 43 describes the media types and associated maximum distances for each GBIC type.

Table 43: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

If you have an Alpine 3800 series switch populated with a GM-4Xi module, do one of the following:

- Install a maximum of three LX100 GBICs per GM-4Xi module; the fourth GBIC slot must remain empty

- Install two or less LX100 GBICs per GM-4Xi module and leave the remaining GBIC slots empty
- Install two or less LX100 GBICs per GM-4Xi module and install any combination of the following GBICs into the empty slots:
  - 1000BASE-SX
  - 1000BASE-LX
  - ZX GBIC
  - ZX Rev 03
  - LX70
  - UTP GBIC

To ensure correct operation of the LX100 GBIC, make sure that you run ExtremeWare 6.1.9 or later on your switch.

NOTE

For more information about the supported GBIC types, see "GBIC Specifications" on page 32.

LEDs

The GM-4Xi module has the following LEDs:

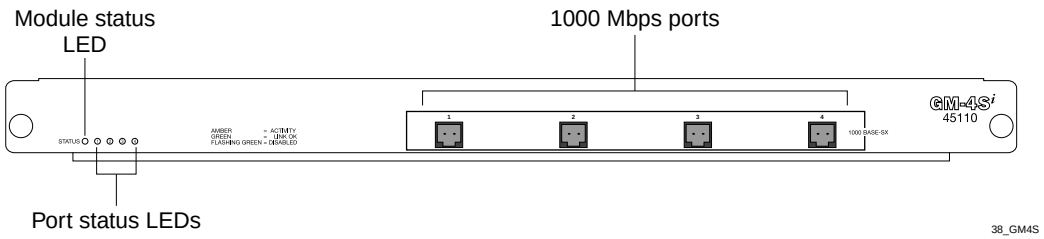
- Module status
- Port status

For information about the LEDs and their activity on the GM-4Xi module, see "I/O Module LEDs" on page 176.

GM-4Si Module

Figure 76 shows the GM-4Si module.

Figure 76: GM-4Si module



The GM-4Si module has four Gigabit Ethernet ports using standard MT-RJ connectors. The GM-4Si module supports 1000BASE-SX only.

The default configuration of the GM-4Si module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in autonegotiation mode.

Table 44 describes the optical specifications for the GM-4Si module.

Table 44: GM-4Si module optical specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-9.5 dBm		-4 dBm
Center wavelength	830 nm	850 nm	860 nm
Receiver			
Optical input power sensitivity	-17 dBm		
Optical input power maximum			0 dBm
Operating wavelength	830 nm		860 nm

LEDs

The GM-4Si module has the following LEDs:

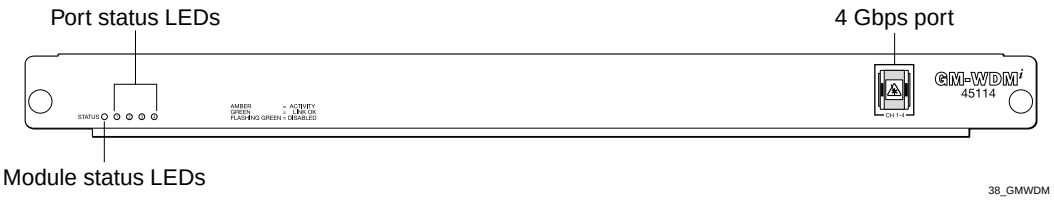
- Module status
- Port status

For information about the LEDs and their activity on the GM-4Si module, see “I/O Module LEDs” on page 176.

GM-WDMi Module

Figure 77 shows the GM-WDMi module.

Figure 77: GM-WDMi module



The GM-WDMi module has one 4 Gbps port, which supports four full-duplex Gigabit Ethernet channels. The port transmits over a single mode fiber cable using wavelength division multiplexing. The port uses an SC-APC simplex connector with a spring-loaded safety cover. APC connectors are polished at an 8° angle to minimize loss and reflections over extended transmit distances.

The default configuration of the GM-WDMi module is as follows. The port:

- Is added to the default VLAN as untagged.
- Inherits the properties of the default VLAN (protocol type, VLANid, and so forth).

The GM-WDMi module transmits bi-directionally on the fiber cable and then multiplexes these wavelengths over the single-mode optical fiber.

The total optical system budget for the GM-WDMi module is 12 dB. Measure cable plant losses with a 1550 nm light source to verify that your cable plant losses are within the optical budget. Table 45 describes the optical specifications for the GM-WDMi module.

Table 45: GM-WDMi optical interface specifications

Parameter	Minimum	Typical	Maximum
Transmitter			
Optical output power	-5 dBm	-3 dBm	-1 dBm
Channel 1 wavelength	1495 nm	1501 nm	1507 nm
Channel 2 wavelength	1515 nm	1521 nm	1527 nm
Channel 3 wavelength	1535 nm	1541 nm	1547 nm
Channel 4 wavelength	1555 nm	1561 nm	1567 nm
Receiver			
Optical input power sensitivity	-17 dBm		
Optical input power maximum			-1 dBm
Fiber Optic Cable			
Back reflection			-25 dB
General			
Total system budget			12 dBm

Extreme Networks recommends that you reserve 3 dB for losses due to cable splices, connectors, and operating margin. Table 46 describes the cable attenuation, cable budget, and operating distance for a variety of cable attentuation ratings for the GM-WDMi module.

Table 46: GM-WDMi maximum transmit distances

Cable Attenuation	Cable Budget	Maximum Distance
0.20 dB/km	9 dB	45 km
0.25 dB/km	9 dB	36 km
0.30 dB/km	9 dB	30 km

A minimum of 2 dB attenuation is required to prevent saturation of the receiver.

LEDs

The GM-WDMi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the GM-WDMi module, see “I/O Module LEDs” on page 176.

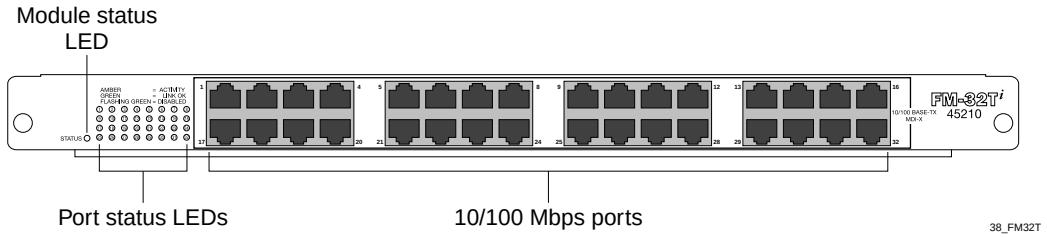
Software Requirements

The GM-WDMi module requires that you load ExtremeWare version 6.1.8 or later and BootROM 6.5 or later on your switch.

FM-32Ti Module

Figure 78 shows the FM-32Ti module.

Figure 78: FM-32Ti module



The FM-32Ti module has 32 10/100 Mpbs autonegotiating Ethernet ports, using standard RJ-45 connectors. The FM-32Ti module supports autonegotitation of 10BASE-T and 100BASE-TX.

The default configuration of the FM-32Ti module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so on).
- Operate in autonegotiation mode.

LEDs

The FM-32Ti module has the following LEDs:

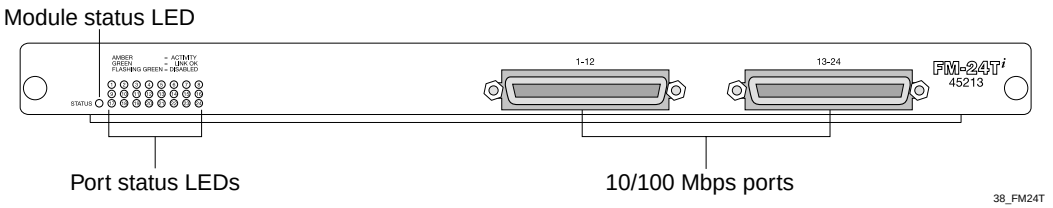
- Module status
- Port status

For information about the LEDs and their activity on the FM-32Ti module, see “I/O Module LEDs” on page 176.

FM-24Ti Module

Figure 79 shows the FM-24Ti module.

Figure 79: FM-24Ti module



The FM-24Ti module has 24 10/100 Mbps autonegotiation Ethernet ports, using standard RJ-21 connectors. The FM-24Ti module supports 10BASE-T and 100BASE-TX.

Table 47 describes the cable specifications for the Alpine FM-24Ti module. Appropriate cables are available from your local supplier.

Table 47: FM-24Ti cable specifications

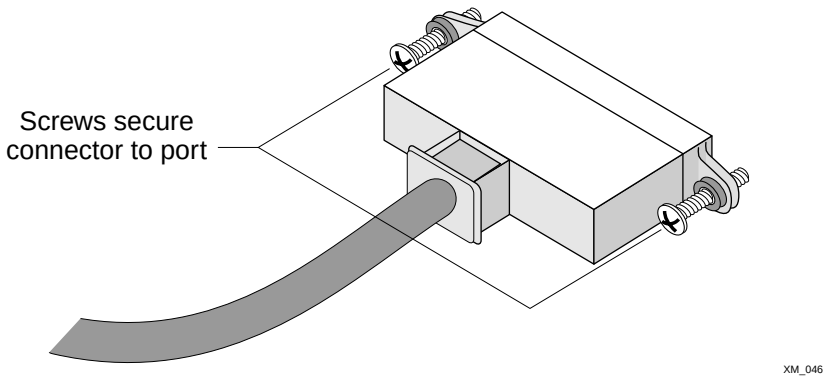
Connectors	Cable	Min Length	Max Length	Max Torque
Lucent 525 Telco 50-pin RJ-21	Shielded trunk cable with 25 CAT5 twisted pairs	1 m	100 m	4 in-lbs

To access the ports, use a 180-degree male RJ-21 connector with a shielded PVC trunk cable and secure to a maximum of 4 in-lbs of torque. You can access the ports in one of the following ways:

- Through a patch panel by terminating the cable and shield with an RJ-21 connector.
- Directly by using a cable that is terminated with 12 RJ-45 connectors.

The RJ-21 connector is shown in Figure 80.

Figure 80: RJ-21 connector



The default configuration of the FM-24Ti module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in autonegotiation mode.

LEDs

The FM-24Ti module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the FM-24Ti module, see “I/O Module LEDs” on page 176.

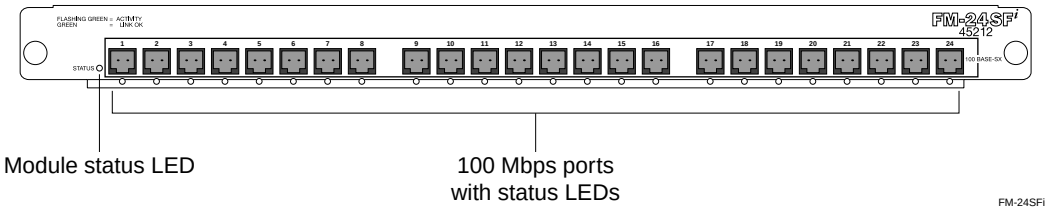
Software Requirements

The FM-24Ti module requires that you load ExtremeWare software version 6.1.7 or later and BootROM 6.5 or later on your switch.

FM-24SFi Module

Figure 81 shows the FM-24SFi module.

Figure 81: FM-24SFi module



The FM-24SFi module has 24 100 Mbps Ethernet ports, using standard MT-RJ connectors. The FM-24SFi module supports 100BASE-FX in single mode only.

The default configuration of the FM-24SFi module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in 100 Mbps, single mode. Half-duplex mode is not supported.

The total optical system budget for the FM-24SFi module is 11 dB. Measure cable plant losses with a 1310 nm light source to verify that your cable plant losses are within the optical budget. Table 48 describes the optical specifications for the FM-24SFi module

Table 48: FM-24SFi optical interface specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-20 dBm		-14 dBm
Center wavelength	1510 nm		
Receiver			
Optical input power sensitivity	-31 dBm		
Optical input power maximum			-8 dBm
Operating wavelength	1510 nm		
General			
Total system budget			11 dBm

LEDs

The FM-24SFi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the FM-24SFi module, see “I/O Module LEDs” on page 176.

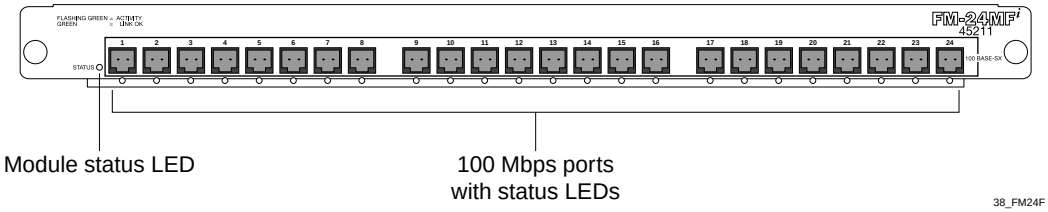
Software Requirements

The FM-24SFi module requires that you load ExtremeWare version 6.1.7 or later and BootROM 6.5 or later on your switch.

FM-24MFi Module

Figure 82 shows the FM-24MFi module.

Figure 82: FM-24MFi module



The FM-24MFi module has 24 100 Mbps Ethernet ports, using standard MT-RJ connectors. The FM-24MFi module supports 100BASE-FX in multi-mode only.

The default configuration of the FM-24MFi module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in 100 Mbps, multi-mode. Half-duplex mode is not supported.

The total optical system budget for the FM-24MFi module is 11 dB. Measure cable plant losses with a 1310 nm light source to verify that your cable plant losses are within the optical budget. Table 49 describes the optical specifications for the FM-24MFi module

Table 49: FM-24MFi optical interface specifications

Parameter	Minimum	Typical	Maximum
Transceiver			
Optical output power	-20 dBm		-14 dBm
Center wavelength	1310 nm		
Receiver			
Optical input power sensitivity	-31 dBm		
Optical input power maximum			-14 dBm
Operating wavelength	1310 nm		
General			
Total system budget			11 dBm

LEDs

The FM-24MFi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the FM-24MFi module, see “I/O Module LEDs” on page 176.

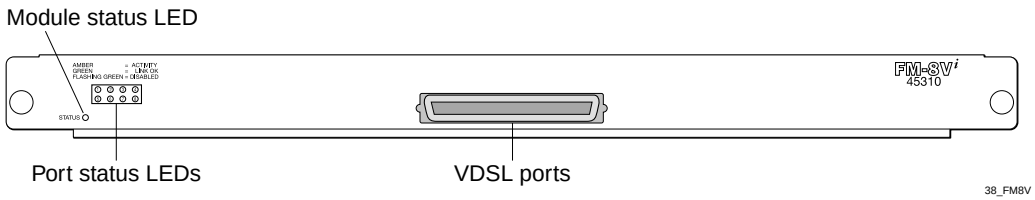
Software Requirements

The SMMi requires ExtremeWare software version 6.1.5 or later to operate the FM-24MFi.

FM-8Vi Module

Figure 83 shows the FM-8Vi module.

Figure 83: FM-8Vi module



The FM-8Vi module has eight 10 Mbps VDSL ports, using one standard RJ-21 connector, and eight internal loopback ports for ingress rate-shaping. The FM-8Vi module supports 10BASE-S.

The default configuration of the FM-8Vi module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in autonegotation mode.

Connecting the FM-8Vi Module to the Mogul-100

The FM-8Vi uses a single RJ-21 connector for the eight VDSL ports on the module. The cable connector on the FM-8Vi has a Velcro™ strap to secure the connector on the cable to the module.

To deliver this VDSL connection to a subscriber, the bundle of twisted pairs that are contained in the RJ-21 cable must be separated for connection to individual Mogul-100 customer premises equipment. Typically, you connect the cable from the FM-8Vi to a punch-down block and wire the individual VDSL circuits into RJ-11 jacks for connection to the Mogul-100s. Use the two center conductors of the RJ-11 connector to connect the wire pairs.

Your particular installation depends on the physical cabling in your building.

The connector on the FM-8Vi requires a male terminated RJ-21 cable. The FM-8Vi uses eight of the twenty-five pairs in the cable. Because the RJ-21 standard was established for telecommunications, one wire of each pair is designated as the tip side and the other wire is designated as the ring side.

Table 50 lists the pin numbers on the connector, the color code for the wires, and the associated port number for the wire pair.

Table 50: RJ-21 connector and wire pairs

VDSL Port	Ring Side Pin Number/Wire Color	Tip Side Pin number/Wire Color
1	1 blue white	26 white blue
2	2 orange white	27 white orange
3	3 green white	28 white green
4	4 brown white	29 white brown
5	5 slate white	30 white slate
6	6 blue red	31 red blue
7	7 orange red	32 red orange
8	8 green red	33 red green

LEDs

The FM-8Vi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the FM-8Vi module, see "I/O Module LEDs" on page 176.

Software Requirements

The FM-8Vi module requires that the SMMi has ExtremeWare software version 6.1.5 or later and BootROM 6.5 or later. For more information about software requirements and module configuration, see the *ExtremeWare Release Notes Software Version 6.1.5w2.01 Rev1*. The FM-8Vi module also requires a connection to the Mogul-100. For more information about Mogul-100 configuration, see the *Mogul-100 Quick Guide*.

Configuring the FM-8Vi. The VDSL connection from the FM-8Vi to the Mogul-100 is automatically established by the hardware on the two devices. There are no commands to configure this VDSL connection.

However, the VDSL ports on the FM-8Vi connect to the Mogul-100 in such a way that the Ethernet port on the Mogul-100 behaves as though it is located on the Alpine switch. When you configure a port on the FM-8Vi, you are configuring the Ethernet port on the Mogul-100. For example, when you add port 2 on the FM-8Vi to a VLAN, the Ethernet port on the Mogul-100 connected to port 2 of the FM-8Vi now belongs to that VLAN.

The ports on the Mogul-100 that are controlled by the FM-8Vi accept configurations using the same commands and procedures as the ports on the FM-32Ti and FM-24Fi modules, except that the ports can only be configured for 10 Mbps.

The slot configuration command now includes a keyword to specify the FM-8Vi. To configure the slot for the FM-8Vi, use the following command:

```
config slot <slot> module fm8v
```

The following example configures slot 2 for the FM-8Vi module:

```
config slot 2 module fm8v
```

Displaying VDSL Statistics. For the FM-8Vi module, the show port command has been enhanced to show VDSL statistics. To display VDSL statistics, use the following command:

```
show port <portlist> vdsl stats
```

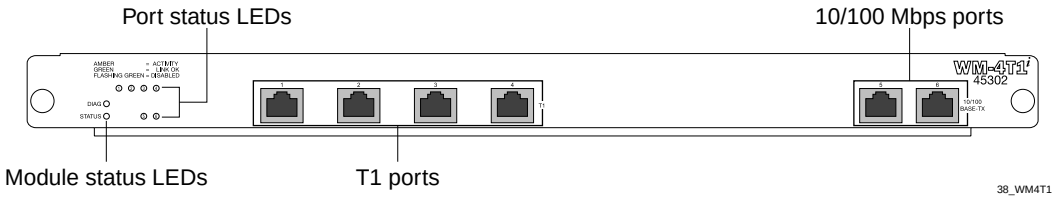
The following command displays the VDSL statistics for ports 2:1 through 2:4:

```
show port 2:1-2:4 vdsl stats
```

WM-4T1i Module

Figure 84 shows the WM-4T1i module.

Figure 84: WM-4T1i module



The WM-4T1i module has four T1 ports, using RJ-48 connectors, and two 10/100 Mbps autonegotiating Ethernet ports, using standard RJ-45 connectors. The WM-4T1i also has eight internal loopback ports that allow you to configure bi-directional rate-limiting without tying up any of the external ports for ingress rate shaping. Internal loopback ports are marked with the notation “iL” when displayed on the command line or with ExtremeWare Vista Web access. The WM-4T1i module supports T1 and autonegotiation of 10BASE-T and 100BASE-T.

The default configuration of the WM-4Ti module is as follows:

- The four T1 ports allow 1.54 Mbps, and the other two ports in autonegotiation mode allow 10 Mbps or 100 Mbps, and full duplex or half-duplex operation.

WARNING!

To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord.

You must ground the Alpine 3800 series chassis to ensure safe operation of the WM-4T1i module. For information about grounding requirements for the Alpine 3800 series chassis, see “Grounding the Alpine 3800 Series Chassis” on page 138.

LEDs

The WM-4T1i module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the WM-4T1i module, see “I/O Module LEDs” on page 176.

Software Requirements

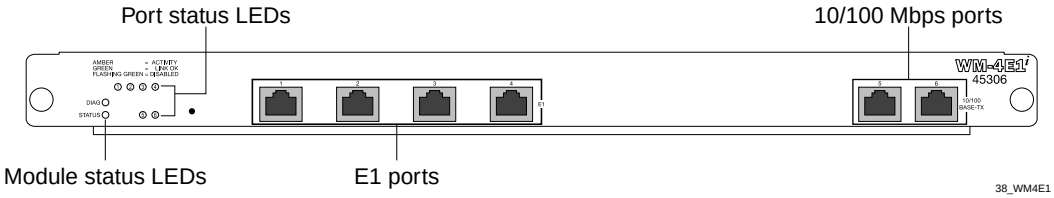
The WM-4T1i module requires that you load ExtremeWare software version 6.1.5 or later and BootROM 6.5 or later on your switch.

For more information about software requirements and WM-4T1i module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide.*

WM-4E1i Module

Figure 85 shows the WM-4E1i module.

Figure 85: WM-4E1i module



The WM-4E1i module has four E1 ports, using RJ-48 connectors, and two 10/100 Mbps autonegotiating Ethernet ports, using standard RJ-45 connectors. The WM-4E1i also has eight internal loopback ports that allow you to configure bi-directional rate-limiting without tying up any of the external ports for ingress rate shaping. Internal loopback ports are marked with the notation “iL” when displayed on the command line or with ExtremeWare Vista Web access. The WM-4E1i module supports E1 and autonegotiation of 10BASE-T and 100BASE-T.

The default configuration of the WM-4E1i module is as follows:

- The four E1 ports allow 1.54 Mbps, and the other two ports in autonegotiation mode allow 10 Mbps or 100 Mbps, and full duplex or half-duplex operation.

LEDs

The WM-4E1i module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the WM-4E1i module, see “I/O Module LEDs” on page 176.

Software Requirements

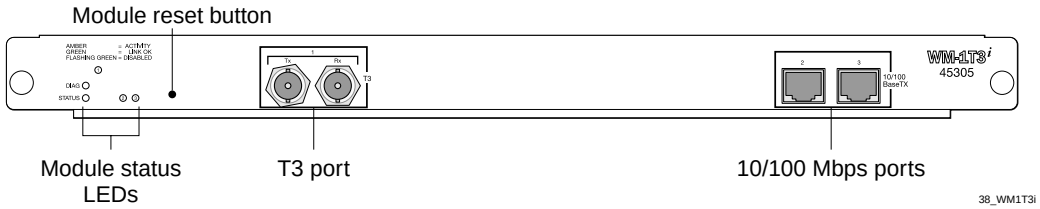
The WM-4E1i module requires ExtremeWare software version 6.1.5 or later and BootROM 6.5 or later.

For more information about software requirements and WM-4E1i module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide.*

WM-1T3i Module

Figure 86 shows the WM-1T3i module.

Figure 86: WM-1T3i module



The WM-1T3i module has one T3 port, consisting of a two BNC connectors, one for the transmit path and one for the receive path. The module also has two general purpose 10/100 Ethernet ports, using standard RJ-45 connectors. The WM-1T3i also has eight internal loopback ports that allow you to configure bi-directional rate-limiting without tying up any of the external ports for ingress rate shaping. Internal loopback ports are marked with the notation “iL” when displayed on the command line or with ExtremeWare Vista Web access.

For the WM-1T3i module, use RG-59 75 ohm coax cable.

LEDs

The WM-1T3i module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the WM-1T3i module, see “I/O Module LEDs” on page 176.

Software Requirements

The WM-1T3i module requires ExtremeWare software version 6.1.5 or later and BootROM 6.5 or later.

For more information about software requirements and WM-1T3i module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide.*

I/O Module LEDs

Table 51 describes the LED activity on the Alpine I/O modules with the green stripe (for example, the GM-4Ti, GM-4Xi, and FM-24MFi I/O modules). Table 52 describes the LED activity on the Alpine Access I/O modules with the silver stripe (for example, the WM-4T1i, WM-4E1i, and WM-1T3i I/O modules).

Table 51: Alpine I/O module LEDs (green stripe)

LED	Color	Indicates
Status	Green	Normal operation
	Amber	Disabled

Table 51: Alpine I/O module LEDs (green stripe) (continued)

LED	Color	Indicates
Port (all except FM-24MFi and FM-24SFi)	Green	Link up
	Flashing green	Disabled
	Amber	Packet activity
	Off	Link down
Port (FM-24MFi and FM-24SFi only)	Green	Link up
	Flashing green	Packet activity
	Off	Link down

Table 52: Alpine Access I/O module LEDs (silver stripe)

LED	Color	Indicates
Status	Off	No power
	Amber	Module seated in chassis
	Green	Module powered up
Diag[1]	Green blinking	Power-on Self Test (POST) is running
	Off	Normal operation
WAN port (1-4)T1/E1 (1)T3	Amber	Near-end fault has been detected (for example, no cable)
	Amber rapidly blinking[1]	Far-end fault has been detected
	Amber slowly blinking[2]	Physical link is present, but no higher-layer link (port is misconfigured or disabled)
	Green	Physical link is present, higher-layer link is established, but no traffic is present
	Alternating green and amber	Physical link is present, higher-layer link is established, and traffic is present
	Green rapidly blinking[2]	Loopback testing mode is in progress
	Green slowly blinking[3]	Port is active, but disabled
10/100 port (5,6)T1/E1 (2,3)T3	Off	No link is present
	Green	Link is present
	Alternating green and amber	Traffic is present

1 The Diag LED is on the WM-4T1i module only.
2 The slowly blinking LEDs cycle once per second.
3 The rapidly blinking LEDs cycle twice a second.

Installing I/O Modules

You can insert I/O modules at any time, without causing disruption of network services.

You need the following tools and equipment to install an I/O module:

- ESD-preventive wrist strap

- # 1 Phillips screwdriver
- I/O module
- Appropriate type of cable for the I/O module you plan to install

To install an I/O module:

1 Select a slot for the module:

- Slots numbered 1 through 8 in the Alpine 3808 chassis
- Slots numbered 1 through 4 in the Alpine 3804 chassis
- Slots numbered 1 through 3 in the Alpine 3802 chassis

CAUTION

Do not install I/O modules into the top, unnumbered slot of the Alpine 3808 or Alpine 3804 chassis; this slot is designated for SMMi modules only. I/O modules do not fit in the top slot of the Alpine 3808 or the Alpine 3804 chassis. Forceful insertion can damage the I/O module.

2 Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.

3 Remove the blank faceplate from the slot to make room for the module, if applicable.

NOTE

Any unoccupied module slot in the chassis should have a blank faceplate installed to ensure satisfactory protection from EMI and to guarantee adequate airflow through the chassis.

4 Grasp the module by its front panel with one hand, and place your other hand under the edge of the metal panel. Check the connectors for dust and packing materials.

CAUTION

To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

5 Ensure that the module is horizontal with the module name to the right, the PCB on top, and that the ejector/injector levers are extended.

a Slide the module into the appropriate slot of the chassis (slots 1 through 8 in the Alpine 3808, slots 1 through 4 in the Alpine 3804, or slots 1 through 3 in the Alpine 3802), until it makes contact with the backplane.

NOTE

Use the metal panel, not the PCB, to guide the I/O module.

As the module begins to seat in the chassis, the ejector/injector levers begin to close.

b To close the ejector/injector levers, use both hands simultaneously to push the levers toward the center of the module.

c To secure the module, tighten the two captive screws using a #2 Phillips screwdriver.

NOTE

Tighten the screws of this module before *you insert additional modules. Otherwise, you might unseat modules that you have not secured.*

6 Store the module packaging for future use.

7 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To install additional I/O modules, repeat steps 1 through 6.

Verifying the I/O Module Installation

After you install an I/O module, verify that it is working correctly. Check the LEDs on the front panel of the I/O module and use the command-line interface (CLI) `show slot <slot number>` command to display slot-specific information about the newly installed module.

LED Indicators

When the I/O module and its ports are configured and operating normally, the front-panel LED indicators should appear as follows:

- STATUS LED—green
- DIAG LED (WM-4Ti module only)—off
- Port status LED (per port):
  - Green (all modules except WM-4T1i)
  - Alternating green and amber (WM-4Ti1 module only)

For more information about I/O module LED activity, see “I/O Module LEDs” on page 176.

Displaying Slot Status Information

Assuming the I/O module has no problems, the command `show slot <slot>` (where *<slot>* is the number of the slot where you installed the module) displays information about the module including: general information about the module (name, serial number, part number), the state of the module (power down, operational, mismatch between the slot configuration and the module in the slot), and the status of the ports on the module.

For more information about slot status information, see the *ExtremeWare Software User Guide* and the *ExtremeWare Command Reference Guide*.

Removing I/O Modules

All Alpine 3800 series modules (SMMi and I/O modules) are hot-swappable. You do not need to power off the system to remove a module.

You need the following tools and equipment to remove an I/O module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement I/O module or blank faceplate if you are not replacing the I/O module

To remove an I/O module:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.
2. Use a #2 Phillips screwdriver to unscrew the two captive screws.
3. Simultaneously rotate the ejector/injector levers away from the center of the module to disengage the module from the backplane.
   a. Grasp the module front panel with one hand, and place your other hand under the metal panel to support the module.

   CAUTION

   To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

   b. Slide the module out of the chassis and place it immediately into an antistatic sack to protect it from ESD damage and to prevent dust from collecting on the module's connectors.
4. If you are not going to install a replacement I/O module, cover the slot with a blank faceplate. Otherwise, follow the I/O module installation procedure on page 177.
5. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To remove additional modules, repeat steps 1 through 4.

11 Alpine 3800 Series Switch Fan Tray

This chapter describes:

- Alpine 3808 Fan Tray on page 181
- Alpine 3804 Fan Tray on page 182
- Alpine 3802 Fan Tray on page 182
- Removing the Alpine 3808 or Alpine 3804 Fan Tray on page 183
- Installing the Alpine 3808 or Alpine 3804 Fan Tray on page 184

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any Alpine fan tray.

Alpine 3808 Fan Tray

The Alpine 3808 fan tray (no. 45013):

- Contains five individual fans
- Is preinstalled at the factory
- Is accessed from the front of the chassis
- Is hot-swappable which means you can remove and replace the fan tray without powering down the switch
- Can be removed and installed by customers

CAUTION

Do not cover or obstruct the fan ventilation holes at the rear of the unit. Doing so can result in overheating and possible damage to the Alpine 3808 switch. Thermal sensors will shut down the Alpine 3808 switch if the internal temperature exceeds 60 degrees Celsius.

ExtremeWare monitors the fan trays in the Alpine 3808 switch for failure and overheat conditions. All fan failures and over temperature events cause the switch to send alerts to the network management station or to the switch log. See the *ExtremeWare Software User Guide* for more information about switch monitoring.

Alpine 3804 Fan Tray

The Alpine 3804 fan tray (no. 45015):

- Contains three individual fans
- Is preinstalled at the factory
- Is accessed from the front of the chassis
- Is hot-swappable which means you can remove and replace the fan tray without powering down the switch
- Can be removed and installed by customers

CAUTION

Do not cover or obstruct the fan ventilation holes at the rear of the unit. Doing so can result in overheating and possible damage to the Alpine 3804 switch. Thermal sensors will shut down the Alpine 3804 switch if the internal temperature exceeds 60 degrees Celsius.

ExtremeWare monitors the fan trays in the Alpine 3804 switch for failure and overheat conditions. All fan failures and over temperature events cause the switch to send alerts to the network management station or to the switch log. See the *ExtremeWare Software User Guide* for more information about switch monitoring.

Alpine 3802 Fan Tray

The Alpine 3802 fan tray:

- Contains two individual fans
- Is preinstalled at the factory
- Is not hot-swappable which means you must power down the switch before you can remove and replace the fan tray
- Cannot be removed and installed by customers
- Must be removed and replaced by personnel trained by Extreme Networks

CAUTION

Do not cover or obstruct the fan ventilation holes at the rear of the unit. Doing so can result in overheating and possible damage to the Alpine 3802 switch. Thermal sensors will shut down the Alpine 3802 switch if the internal temperature exceeds 60 degrees Celsius.

NOTE

In the event of a fan tray failure, please contact Extreme Networks.

ExtremeWare monitors the fan trays in the Alpine 3802 switch for overheat conditions. All over temperature events cause the switch to send alerts to the network management station or to the switch log. See the *ExtremeWare Software User Guide* for more information about switch monitoring.

Removing the Alpine 3808 or Alpine 3804 Fan Tray

Alpine 3808 and Alpine 3804 fan trays are hot-swappable. You do not need to turn off power to an Alpine 3808 or Alpine 3804 switch to remove a fan tray.

You need the following tools and equipment to remove a fan tray:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver

CAUTION

Only trained service personnel should perform service to Alpine 3808 or Alpine 3804 fan trays. Before installing or removing any components, or carrying out any maintenance procedures, see Appendix A.

To remove the fan tray from the Alpine 3808 or Alpine 3804 switch:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.
2. Unscrew the two captive screws that secure the fan tray to the chassis by turning them counterclockwise (to the left).
3. Use the finger grips to pull the fan tray out of the chassis approximately 1-inch (2.54 cm), as shown in Figure 87 and Figure 88; this step disconnects the power and causes the fans to stop rotating.
4. Allow the fan blades to stop spinning before you remove the fan tray from its slot.

   WARNING!

   Keep your hands away from rotating fan blades.

5. To support the fan tray, place one hand under the fan tray and use the other hand to pull the fan tray from its slot.
6. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Figure 87: Alpine 3808 fan tray

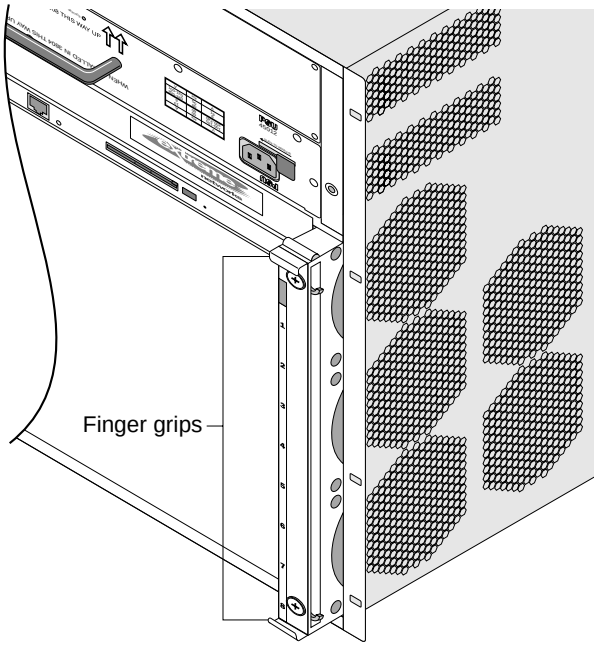
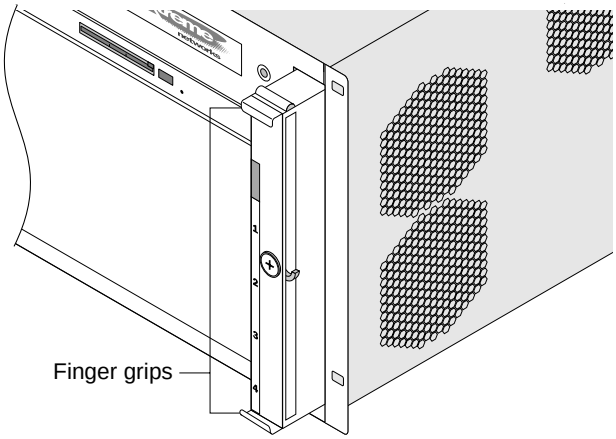


Figure 88: Alpine 3804 fan tray



Installing the Alpine 3808 or Alpine 3804 Fan Tray

Alpine 3808 and Alpine 3804 fan trays are hot-swappable. You do not need to turn off power to an Alpine 3808 or Alpine 3804 switch to install a fan tray.

You need the following tools and equipment to install a fan tray:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement fan tray

CAUTION

Only trained service personnel should perform service to Alpine 3808 or Alpine 3804 fan trays. Before installing or removing any components, or carrying out any maintenance procedures, see Appendix A.

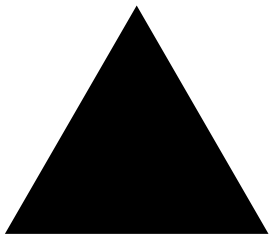
To install the fan tray in the Alpine 3808 or Alpine 3804 switch:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-right corner of the switch front panel.
2. Check the connectors for dust and packing materials.
3. To support the fan tray, place one hand under the fan tray and use the other hand to guide the fan tray into the slot. Gently begin to insert the new fan tray into the slot.

   NOTE

   If the chassis is powered on, the fan blades will begin turning as soon as the tray makes contact with the backplane.

4. To secure the fan tray, turn the screws clockwise until they become tight.
5. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.



Part 5
BlackDiamond Switch

12 BlackDiamond 6800 Series Switch Overview

The BlackDiamond 6800 series switches are chassis-based switches designed to be placed in the core of your network. The BlackDiamond 6800 series switches are flexible and scalable, making it easy for you to meet the changing requirements of your network. Three models exist:

- The BlackDiamond 6816 20-slot chassis, which can be populated with up to 16 input/output (I/O) modules and four Management Switch Fabric Modules (MSM64i modules)
- The BlackDiamond 6808 10-slot chassis, which can be populated with up to eight I/O modules and two MSM64i modules
- The BlackDiamond 6804 6-slot chassis, which can be populated with up to four I/O modules and two MSM64i modules

The combination of BlackDiamond, Alpine, and Summit switches delivers a consistent end-to-end network solution that provides a nonblocking architecture, wire-speed switching, wire-speed IP routing, and policy-based Quality of Service (QoS).

This chapter describes:

- Summary of Features on page 189
- Switch Components on page 191
- Following Safety Information on page 193

Summary of Features

This section describes the features of the BlackDiamond family of switches. If the information in the release notes differs from the information in this guide, follow the release notes. For more information about configuring the switch, refer to the *ExtremeWare Software User Guide* and *The ExtremeWare Command Reference Guide.*

The features of the BlackDiamond 6800 series switches include:

- I/O modules and MSM64*i* modules are hot-swappable
- Redundant, load-sharing, hot-swappable power supplies
- Field-replaceable, hot-swappable fan tray
- Autonegotiation for half- or full-duplex operation on 10/100 Mbps ports
- Load-sharing on multiple ports

- VLANs, including support for IEEE 802.1Q
- STP (IEEE 802.1D) with multiple STP domains
- Policy-based QoS
- Wire-speed IP routing
- IP multinetting
- DHCP/BOOTP relay
- RIP version 1 and RIP version 2
- OSPF routing protocol
- IPX routing, including RIP and SAP
- Wire-speed IP multicast routing
- IGMP and IGMP snooping to control IP multicast traffic
- DVMRP
- Console (RS-232) CLI connection
- Telnet CLI connection
- ExtremeWare Vista Web-based management interface
- SNMP support

Port Connections

The BlackDiamond 6800 series switches support the following port configurations that are available on the different BlackDiamond I/O modules as described in Table 53.

CAUTION

Modules that use SX, LX, and LX70 interfaces contain Class 1 laser devices. The P3cSi, P3cMi, P12cSi, P12cMi, A3cSi, A3cMi, and WDMi modules also use Class 1 laser devices. These ports can emit invisible laser radiation. Avoid direct eye exposure to beam.

Table 53: Port configurations available on BlackDiamond I/O modules

Ethernet Ports						
Module	**10BASE-T/ 100BASE-TX**	**100BASE-T/ 1000BASE-T**	**GBIC**	**1000BASE-SX**	**100BASE-FX**	**OTHER**
G8Ti		8				
G8Xi			8			
G12SXi				12		
WDMi						1 10-Gbps
10GLRi[1]						1 10GBASE-LR
F32T	32					
F48Ti	48					
F96Ti	96					
F32Fi					32	

Table 53: Port configurations available on BlackDiamond I/O modules (continued)

Ethernet Ports						
Module	**10BASE-T/ 100BASE-TX**	**100BASE-T/ 1000BASE-T**	**GBIC**	**1000BASE-SX**	**100BASE-FX**	**OTHER**
P3cSi						4 OC-3
P3cMi						4 OC-3
P12cSi						2 OC-12
P12cMi						2 OC-12
ARM						N/A
MPLS						N/A
A3cSi						4 OC-3
A3cMi						4 OC-3

1 The 10GLRi module is a single slot I/O module for the BlackDiamond 6808 chassis. No chassis upgrade is required, and the MSM64i management module supports the 10GLRi module.

Switch Components

The BlackDiamond 6816 chassis, the BlackDiamond 6808 chassis, and the BlackDiamond 6804 chassis use the same I/O modules, management modules, and power supplies, but they use different fan trays. The BlackDiamond 6816 chassis only supports modules and power supplies with an "*i*" in their name, such as the MSM64i.

BlackDiamond 6816 Switch

The BlackDiamond 6816 switch consists of the following components:

- One 20-slot chassis with backplane
- 16 I/O module slots, labeled slots 1 through 16
- Four MSM64i slots, labeled slots A through D
- Four power supply bays (accessed from the front of the unit)
- Two fan trays (accessed from the front of the unit)
- Two side mounted handles for lifting the chassis
- One electromagnetic discharge (ESD) wrist strap connector

NOTE

The BlackDiamond 6816 chassis only supports modules and power supplies with an "i" in their name, such as the MSM64i.

BlackDiamond 6808 Switch

The BlackDiamond 6808 switch consists of the following components:

- One 10-slot chassis with backplane

- Eight I/O module slots, labeled slots 1 through 8
- Two MSM64i slots, labeled slots A and B
- Two power supply bays (accessed from the front of the unit)
- One fan tray (accessed from the rear of the unit)
- One electromagnetic discharge (ESD) wrist strap connector

BlackDiamond 6804 Switch

The BlackDiamond 6804 switch consists of the following components:

- One 6-slot chassis with backplane
- Four I/O module slots, labeled slots 1 through 4
- Two MSM64i slots, labeled slots A and B
- Two power supply bays (accessed from the front of the unit)
- One fan tray (accessed from the front of the unit)
- One electromagnetic discharge (ESD) wrist strap connector

BlackDiamond Power Supplies

Three types of power supplies are available for the BlackDiamond switches:

- 220 VAC
- 110 VAC
- -48 VDC

All installed power supplies must be of the same type. You cannot mix 110 VAC, 220 VAC, and -48 VDC power supplies in a single chassis.

All BlackDiamond power supplies are hot-swappable. They are also load-sharing. If one power supply fails in a BlackDiamond 6800 series chassis, the remaining power supplies will provide sufficient power to operate a chassis that has all slots populated with modules.

Switch Connectivity and the Backplane

Switch connectivity is an important aspect of the BlackDiamond 6800 series switch. The MSM64i module is the internal switch fabric for data being sent between I/O modules. No configuration information is stored on the I/O modules; all configuration information is stored on the MSM64i module(s). Each MSM64i has two CPUs for protocol processing and network management. For full redundancy, you can install up to four MSM64i modules in the BlackDiamond 6816 switch and up to two MSM64i modules in the BlackDiamond 6808 and BlackDiamond 6804 switches.

The BlackDiamond 6800 series switch has a 100% passive backplane which means the backplane does not contain any active components that can fail. A passive backplane is important because it increases the reliability of the switch. The I/O modules treat the backplane as one logical connection and use the same load sharing (trunking) algorithm as the front facing ports to distribute the switch traffic. There are multiple Gigabit links from the I/O modules to the MSM64i modules, and most I/O modules have eight full duplex Gigabit Ethernet links to the backplane that provide 16 bps full duplex bandwidth to the backplane. If one of the backplane Gigabit Ethernet links fails, ExtremeWare reroutes the switch traffic from the failed backplane Gigabit Ethernet link to another available backplane link. By moving to another available backplane link, switch connectivity is not disrupted.

With ExtremeWare 6.1 or later, you can configure the backplane load-sharing algorithm. The default load-sharing algorithm uses ingress port-based trunking. In an Internet bridging or routing environment, the address-based algorithm may be more appropriate. For more information about how to configure the backplane load-sharing algorithm, see the *ExtremeWare Software User Guide.*

Packet Switching and Routing

Each installed I/O module has Gigabit Ethernet links that attach to the backplane. The backplane divides these links equally among the MSM64i modules that are installed in the switch. For example, if you install an F48Ti module, it has eight Gigabit Ethernet links to the switch backplane. If you have a BlackDiamond 6816 and install four MSM64i modules, each module receives two of the eight Gigabit Ethernet links. If you have a BlackDiamond 6808 or a BlackDiamond 6804 and install two MSM64i modules, each module receives four of the eight Gigabit Ethernet links.

Following Safety Information

WARNING!

Read the safety information in Appendix A thoroughly before installing your Extreme Networks switch. Failure to follow this safety information can lead to personal injury or damage to the equipment.

- All service to components of a BlackDiamond 6800 series switch should be performed by trained service personnel only. Service personnel are persons having appropriate technical training and experience necessary to be aware of the hazards to which they are exposed in performing a task and of measures to minimize the danger to themselves or other persons.

  NOTE

  Electronic components are sensitive to static electricity. ESD originating from you or from objects around you can damage these components. Exercise every possible precaution to prevent ESD when working around printed circuit assemblies.

  Keep all printed circuit assemblies in protective ESD-preventive sacks or place them on antistatic mats until you are ready to install them. Wear an ESD-preventive wrist strap and ensure that the leash is securely grounded before handling a bare printed circuit assembly.

- Some devices, such as I/O modules, contain fiber optic ports. To protect your eyes, you should never look at the fiber optic ports while they are on, or look directly at the fiber cable ends when they are on.

13 BlackDiamond 6800 Series Switch Chassis

There are three models in the BlackDiamond 6800 series: The BlackDiamond 6816 switch, the BlackDiamond 6808 switch, and the BlackDiamond 6804 switch.

This chapter describes:

- BlackDiamond 6800 Series Architecture on page 195
- Installing the Chassis on page 204
- Removing the Chassis on page 209

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any BlackDiamond chassis.

BlackDiamond 6800 Series Architecture

This section describes and shows the architecture of the BlackDiamond 6800 series chassis. For each chassis, the front view shows an example of a completely installed chassis with optional I/O modules that you can install in the chassis. The rear view shows the back of the chassis.

BlackDiamond 6816 Switch Front View

The BlackDiamond 6816 switch consists of the following components:

- One 20-slot chassis with backplane
- 16 I/O module slots, labeled slots 1 through 16
- Four MSM64i slots, labeled slots A through D
- Four power supply bays (accessed from the front of the unit)
- Two fan trays (accessed from the front of the unit)
- Two side mounted handles for lifting the chassis
- One electromagnetic discharge (ESD) wrist strap connector

The BlackDiamond 6816 switch can support the following number of ports and types of port configurations:

- Up to 1344 switched 10BASE-T/100BASE-TX Ethernet ports
- Up to 448 switched 100BASE-FX Fast Ethernet ports
- Up to 192 switched Gigabit Ethernet ports
- Up to 60 OC3 PoS ports
- Up to 60 OC3 ATM ports
- Up to 30 OC12 PoS ports

NOTE

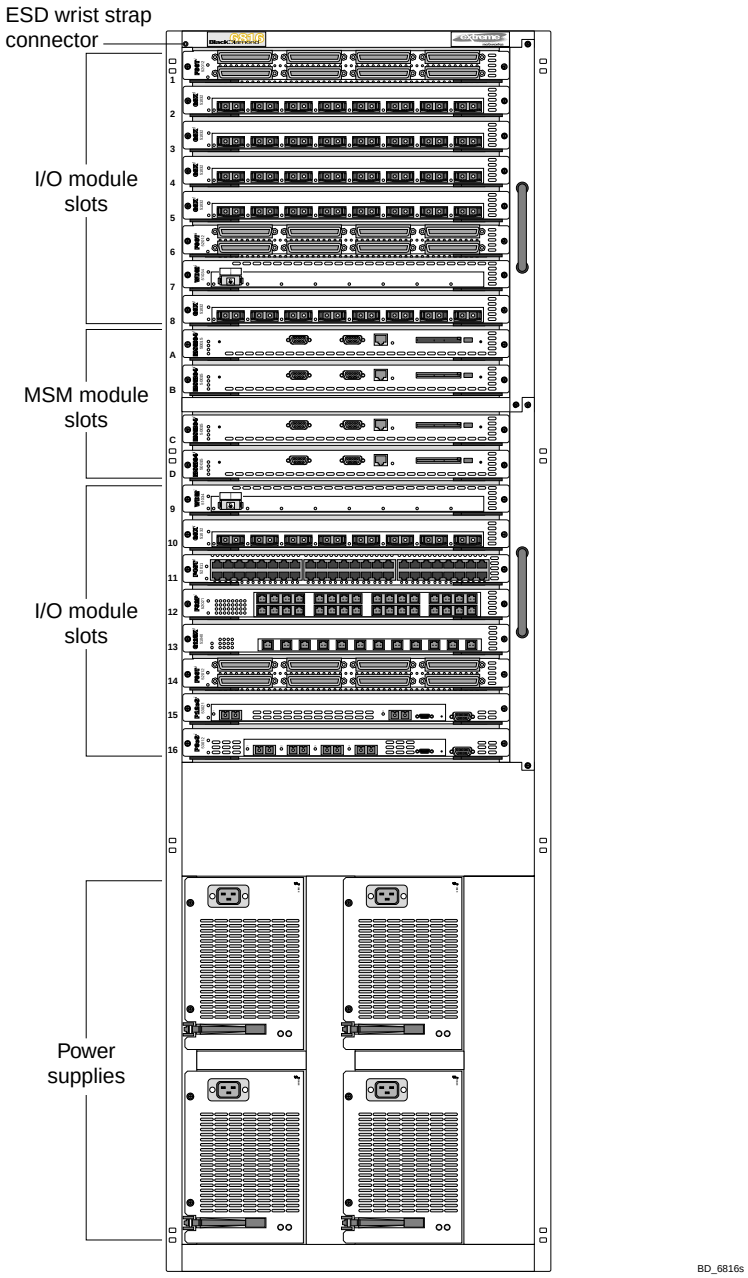
PoS and ATM modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

Figure 89 shows the front view of the BlackDiamond 6816 chassis installed with 4 MSM64i modules and 16 optional I/O modules.

NOTE

The BlackDiamond 6816 chassis only supports modules and power supplies with an "i" in their name, such as the MSM64i.

Figure 89: Front view of the BlackDiamond 6816 switch with sample I/O modules



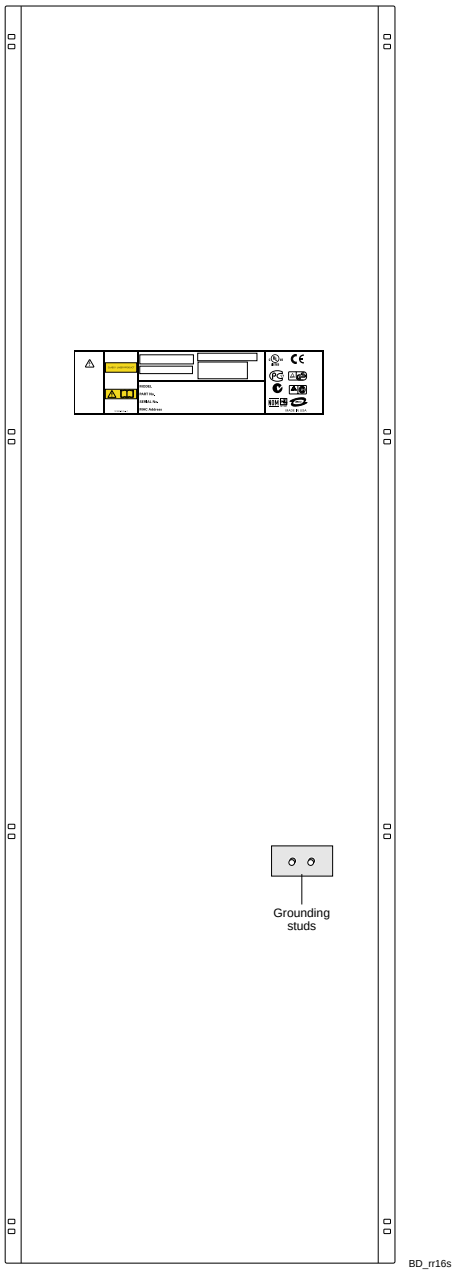
BlackDiamond 6816 Switch Rear View

The rear of the BlackDiamond 6816 switch provides:

- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

Figure 90 shows the rear view of the BlackDiamond 6816 switch.

Figure 90: Rear view of the BlackDiamond 6816 switch



BlackDiamond 6808 Switch Front View

The BlackDiamond 6808 switch consists of the following components:

- One 10-slot chassis with backplane
- Eight I/O module slots, labeled slots 1 through 8
- Two MSM64i slots, labeled slots A and B
- Two power supply bays (accessed from the front of the unit)
- One fan tray (accessed from the rear of the unit)
- One electromagnetic discharge (ESD) wrist strap connector

The BlackDiamond 6808 switch can support the following number of ports and types of port configurations:

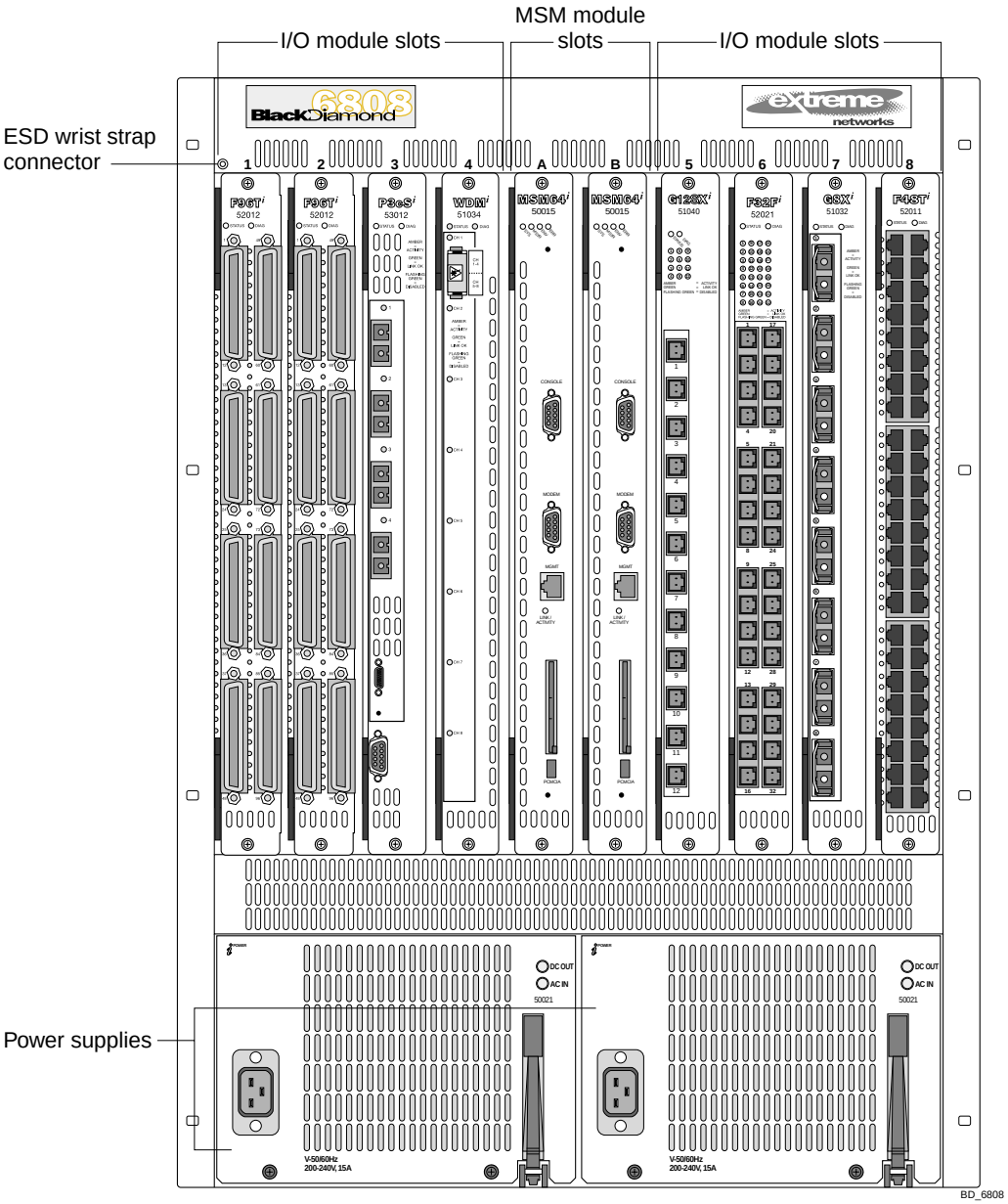
- Up to 672 switched 10BASE-T/100BASE-TX Ethernet ports
- Up to 224 switched 100BASE-FX Fast Ethernet ports
- Up to 96 switched Gigabit Ethernet ports
- Up to 28 OC3 PoS ports
- Up to 28 OC3 ATM ports
- Up to 14 OC12 PoS ports

NOTE

PoS and ATM modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

Figure 91 shows the front view of the BlackDiamond 6808 chassis installed with two MSM64i modules and ten optional I/O modules.

Figure 91: Front view of the BlackDiamond 6808 switch with sample I/O modules



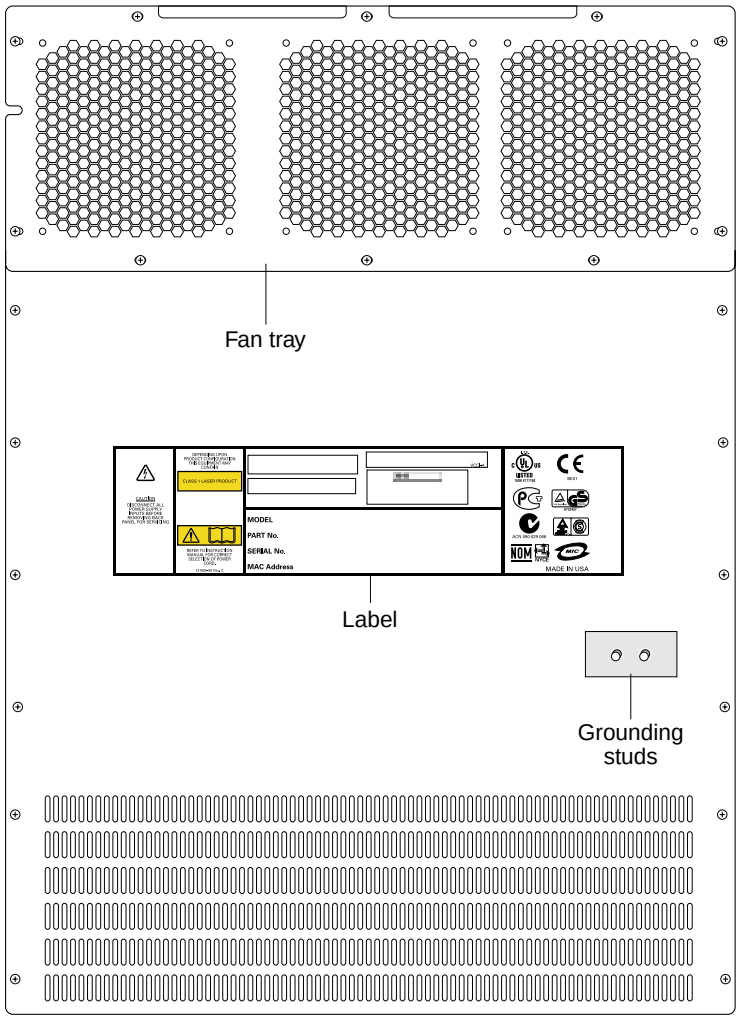
BlackDiamond 6808 Switch Rear View

The rear of the BlackDiamond 6808 switch provides:

- Access to the fan tray
- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

Figure 92 shows the rear view of the BlackDiamond 6808 switch.

Figure 92: Rear view of the BlackDiamond 6808 switch



BlackDiamond 6804 Switch Front View

The BlackDiamond 6804 switch consists of the following components:

- One 6-slot chassis with backplane
- Four I/O module slots, labeled slots 1 through 4
- Two MSM64i slots, labeled slots A and B
- Two power supply bays (accessed from the front of the unit)
- One fan tray (accessed from the front of the unit)
- One electromagnetic discharge (ESD) wrist strap connector

The BlackDiamond 6804 switch can support the following number of ports and types of port configurations:

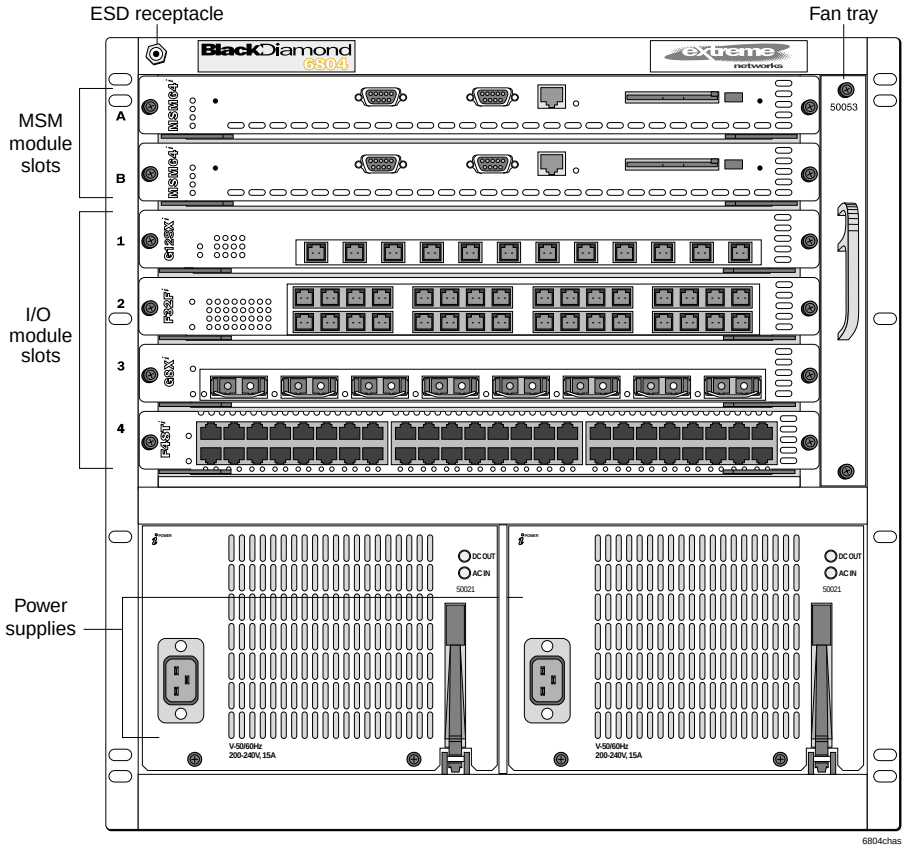
- Up to 384 switched 10BASE-T/100BASE-TX Ethernet ports
- Up to 128 switched 100BASE-FX Fast Ethernet ports
- Up to 48 switched Gigabit Ethernet ports
- Up to 12 OC3 PoS ports
- Up to 12 OC3 ATM ports
- Up to 6 OC12 PoS ports

NOTE

PoS and ATM modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

Figure 93 shows the front view of the BlackDiamond 6804 chassis installed with two MSM64i modules and four optional I/O modules.

Figure 93: Front view of the BlackDiamond 6804 switch with sample I/O modules



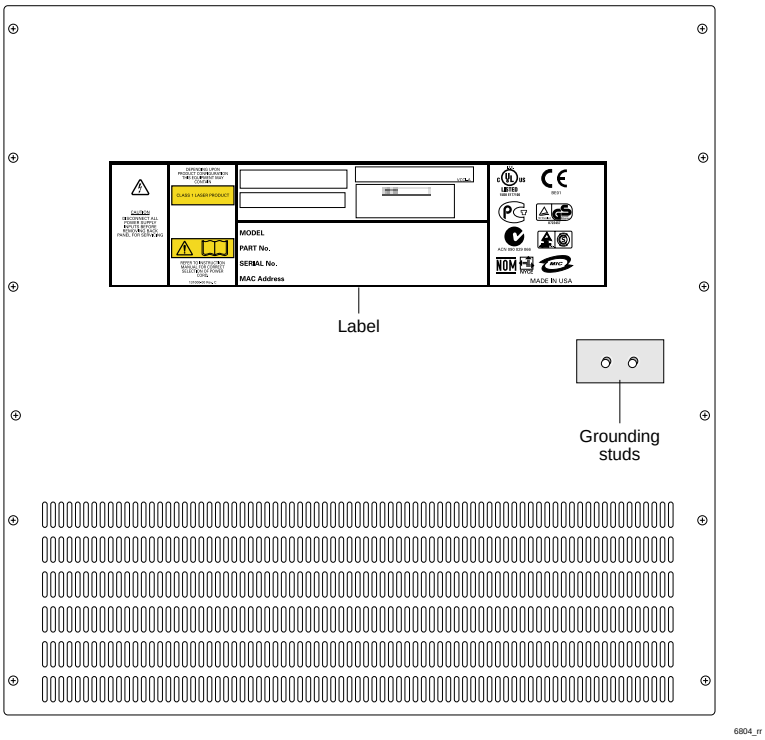
BlackDiamond 6804 Switch Rear View

The rear of the BlackDiamond 6804 switch provides:

- The chassis serial number
- The Ethernet MAC address of the switch
- Symbols of safety certification

Figure 94 shows the rear view of the BlackDiamond 6804 switch.

Figure 94: Rear view of the BlackDiamond 6804 switch



Installing the Chassis

The BlackDiamond 6800 series chassis fits in a standard 19-inch (48.26 cm) rack. Table 54 displays the height measurements for the BlackDiamond 6800 series chassis.

Table 54: BlackDiamond 6800 series chassis height measurements

Switch Model	Height
BlackDiamond 6816	35 U
BlackDiamond 6808	15 U
BlackDiamond 6804	11 U

The BlackDiamond 6800 series chassis is shipped with a preinstalled fan tray. For your safety, due to the increased weight of the chassis after components are installed, and to prevent damage to the equipment, we strongly recommend that you install the power supply and modules after you mount the chassis in a rack.

NOTE

Mount the chassis in a rack before installing any switch components.

Rack Installation

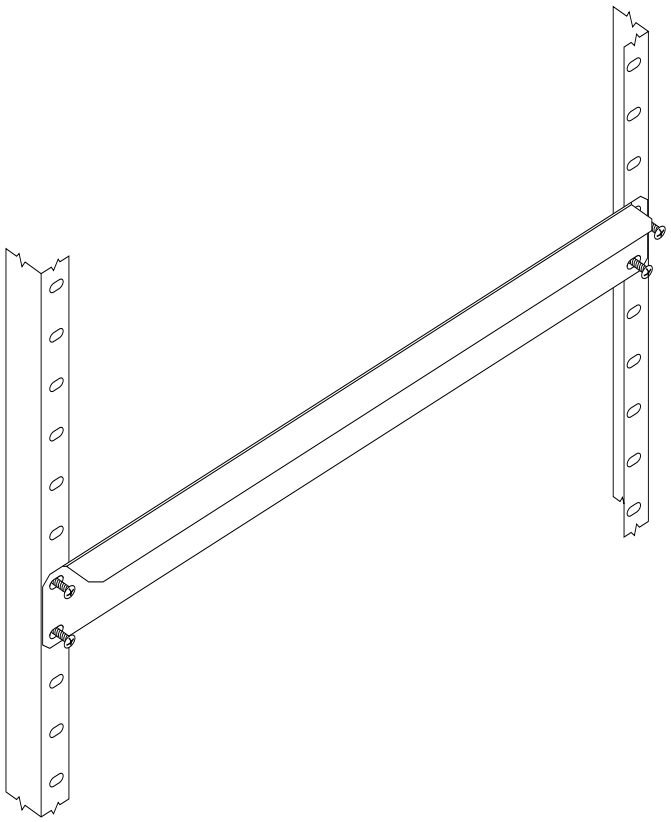
To mount the BlackDiamond 6800 series chassis into a standard 19-inch (48.26 cm) rack, you need the following tools, equipment, and resources:

- Helper bracket (provided)
- A minimum of four appropriate screws to secure the helper bracket (not provided)
- A minimum of eight appropriate screws to secure the chassis into the rack (not provided)
- # 1 Phillips screwdriver
- A minimum of two people to help install the chassis into the rack

To mount the chassis into a rack:

1 Mount the helper bracket in the rack using four appropriate screws (not provided), as shown in Figure 95.

Figure 95: Helper bracket for mounting a BlackDiamond 6800 series chassis



2 Place the chassis upright on a secure flat surface with the front of the box facing you.

3 Remove the chassis from the box, and remove the styrofoam packing material from the chassis.

To protect the interior of the chassis, the chassis comes shipped with sheet metal plates that cover the module slots and the power supply bays. Keep the sheet metal plates on the chassis while you insert the chassis into the rack.

4 Have a minimum of two people lift and place the empty chassis on the helper bracket and slowly guide the chassis into the rack.

NOTE

Do not use the fan tray handle to lift and insert the chassis into the rack.

5 While holding the empty chassis, secure it with a minimum of eight suitable screws, depending on the model, as shown in Figure 96, Figure 97, and Figure 98.

6 After you secure the chassis, remove the helper bracket. Store it for future use, for example, if you need to remove the chassis.

NOTE

To ensure the system meets the NEBS GR-63-CORE Zone 4 earthquake requirements, we recommend the use of a welded steel seismic rack, such as Hendry Telephone Products (www.hendry.com) model: 0GS136.

Figure 96: Securing the BlackDiamond 6816 chassis in a rack

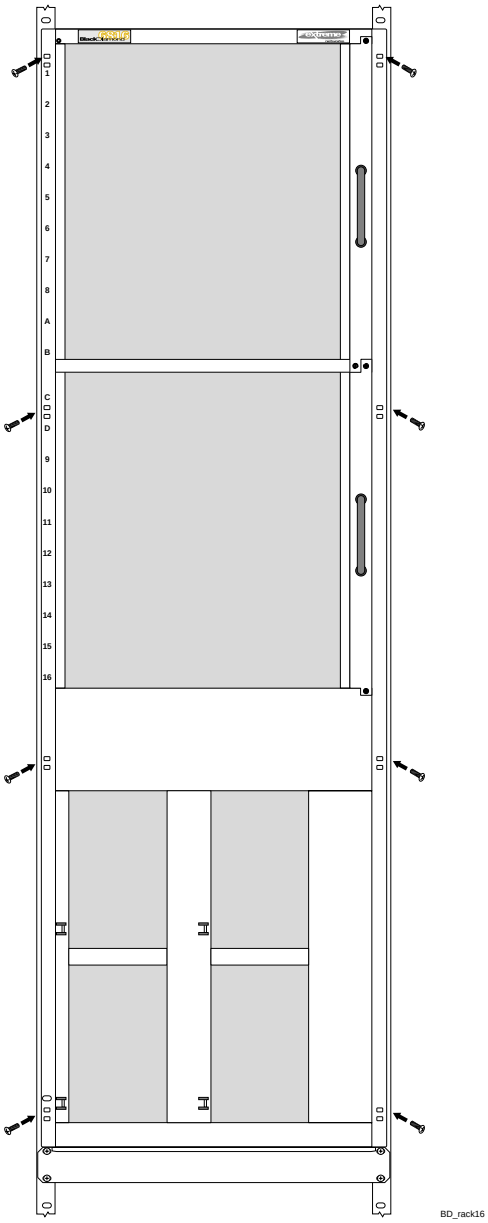


Figure 97: Securing the BlackDiamond 6808 chassis in a rack

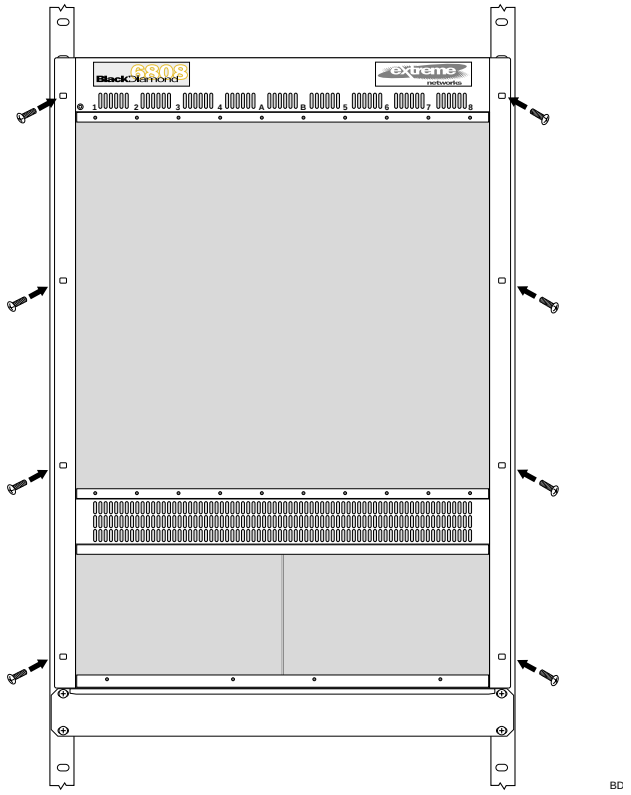
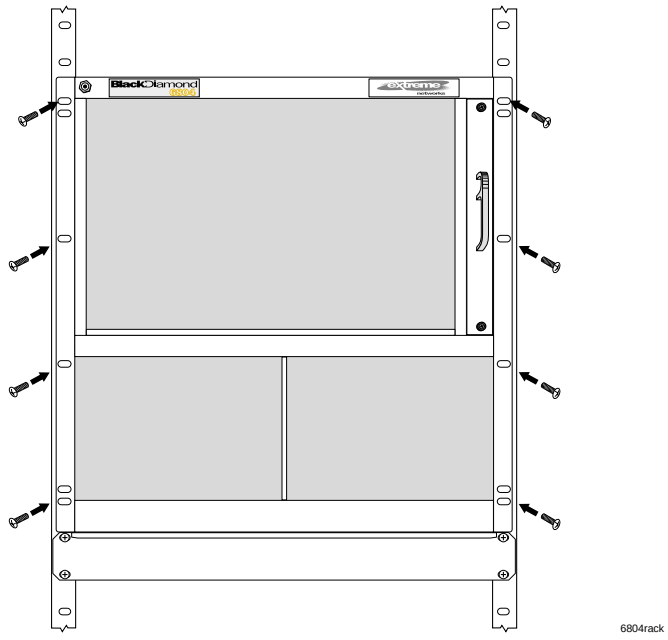


Figure 98: Securing the BlackDiamond 6804 chassis in a rack



Grounding the BlackDiamond 6800 Series Chassis

To ground your BlackDiamond 6800 series chassis in accordance with NEBS standards, gather these materials:

- Two 1/4-20 steel zinc plate screw fasteners approximately 1/2" in length.
- Two zinc-plated steel lockwashers
- One Panduit-style, standard two-hole barrel, copper compression lug
- 4 AWG, high strand-count copper wire cable

To ground the chassis:

1. Strip 0.5 inch (1.2 cm) of insulation from the 4 AWG, high strand-count copper wire cable.
2. Insert the cable into the cable lug.

CAUTION

Ensure that no copper is visible between the lug and the cable insulation.

3. Tighten the cable retention screw, using a $^{1}/_{4}$" or $^{5}/_{16}$" flathead screwdriver, to 20 in-lbs of torque.
4. Attach the ground lug, lock washers, and screw fasteners (in that order) to the grounding studs on the rear of the chassis.

Use cables and lugs with the specifications outlined in Table 55.

Table 55: Cable and lug specifications

Characteristic	Specification
Cable size	4 AWG, high strand count copper wire
Lug	Panduit copper, standard barrel, 2-hole lug—Type LDC (Panduit part number: LCD4-14A-L; Thomas & Betts part number: LCN4-14).
Power	1971 W, 42 to 72 VDC

Removing the Chassis

To uninstall the BlackDiamond 6800 series chassis from a rack, you need the following tools, equipment, and resources:

- Helper bracket (provided)
- A minimum of four appropriate screws to secure the helper bracket (not provided)
- # 1 Phillips screwdriver
- A minimum of two people to help remove the chassis from the rack

To uninstall the chassis from a rack:

1. Unplug the power cable from the outlet and then from the switch before you attempt to remove the chassis components and the chassis from the rack.
2. Mount the helper bracket in the rack directly beneath the chassis using four screws that are appropriate for your rack.

3 To reduce weight and prevent possible equipment damage, use a # 1 Phillips screwdriver to remove the power supply, the MSM64i module(s), and the I/O modules from the BlackDiamond 6800 series chassis.

For information about removing power supplies, see Chapter 14.
For information about removing the MSM64i, see Chapter 15.
For information about removing I/O modules, see Chapter 16.

4 Unscrew the chassis from the rack.

5 Have a minimum of two people gently remove the chassis from the rack and place it on a secure, flat surface with the front of the chassis facing you.

6 Unscrew the helper bracket and remove it from the rack.

14 BlackDiamond 6800 Series Switch Power Supplies

This chapter describes:

- Installing a BlackDiamond 6800 Series Power Supply on page 215
- Removing a BlackDiamond 6800 Series Power Supply on page 221

NOTE

Read the information in this chapter thoroughly before you attempt to install, remove, or supply power to any BlackDiamond power supply.

BlackDiamond power supplies are iPower power supplies. Three types of power supplies are available:

- 220 VAC
- 110 VAC
- -48 VDC

All installed power supplies must be of the same type. You cannot mix 110 VAC, 220 VAC, and -48 VDC power supplies in a single chassis.

All BlackDiamond power supplies are fully fault-tolerant, hot-swappable, and they are load-sharing. Depending upon the modules installed in the chassis, two power supplies can support a fully loaded BlackDiamond 6816 chassis, and one power supply can support a fully loaded BlackDiamond 6808 or BlackDiamond 6804 chassis. To increase switch reliability, you can install additional power supplies as needed. If you have three or more power supplies installed in a BlackDiamond 6816 switch or two or more power supplies installed in a BlackDiamond 6808 or BlackDiamond 6804 switch, you can remove one of the power supplies without turning off power to the chassis.

Table 56 lists the minimum number of power supplies required to power up a BlackDiamond 6800 series chassis.

Table 56: PSUs required to power up the chassis

Switch Model	Number of PSUs Installed
BlackDiamond 6816	2
BlackDiamond 6808	1
BlackDiamond 6804	1

NOTE

If you install four power supplies in your BlackDiamond 6816 chassis, the power supplies will deliver full redundancy.

The BlackDiamond 6800 series switch generates SNMP traps for the following events:

- AC power source fails
- Power supply fails
- Power supply is removed

For more information about planning your site and power requirements, see "Meeting Power Requirements" in Chapter 2. For more information about the specifications of the BlackDiamond 6800 series switch power supplies, see Table 84 on page 304.

220 VAC Power Supplies

If you install a 220 VAC power supply into the BlackDiamond 6800 series chassis, 220 Volts of power is required for full operation. If 110VAC power is supplied, some BlackDiamond I/O modules might not power up. The MSM64i performs power calculations and powers up the maximum number of I/O modules from left (slot 1) to right (slot 8) in the BlackDiamond 6808, or top (slot 1) to bottom (slot 4 in the BlackDiamond 6804 and slot 16 in the BlackDiamond 6816). A module is skipped if that module is not within the power budget. Using 110 VAC, only eight modules in the BlackDiamond 6816, four modules in the BlackDiamond 6808, and two modules in the BlackDiamond 6804 are powered on.

The BlackDiamond switch does not support installing a combination of the old 220 VAC PSUs (part number 50012) with the new iPower 220 VAC PSUs (part number 50021) in the same chassis.

The 220 VAC power supply ships with one L6-20P (locking) power cable.

220 VAC power supplies slide in from the front of the chassis, as illustrated in Figure 99.

Figure 99: 220 VAC power supplies in a BlackDiamond 6808 or a BlackDiamond 6804

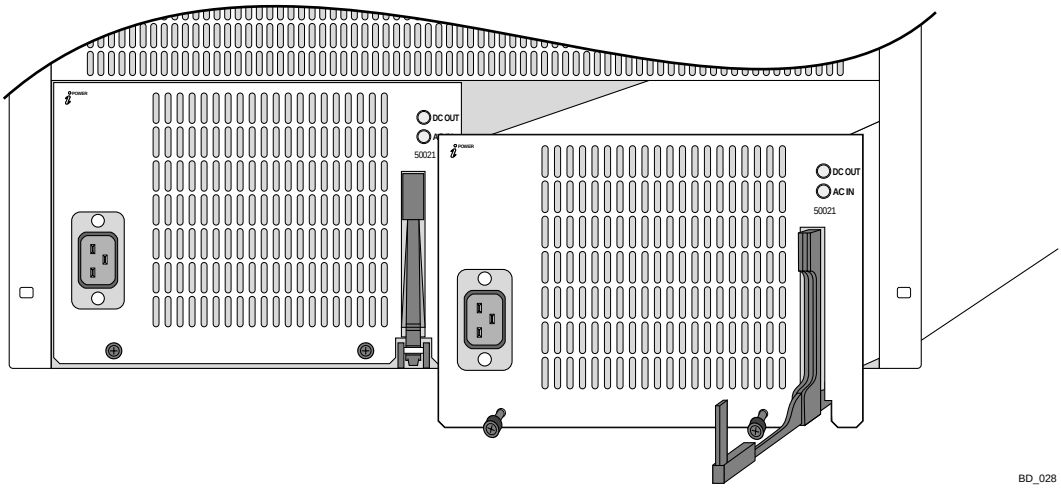


Table 57 describes the LED activity on the 220 VAC power supply

Table 57: LEDs on the 220 VAC power supply

LED	Color	Indicates
AC In	Green	Input voltage is 220 V
	Amber	Input voltage is less than 180 V
	Off	No input power
DC Out	Green	All DC outputs are operational
	Amber	One or more DC outputs have failed
	Off	No power

110 VAC Power Supplies

The BlackDiamond 110 VAC power supply has two IEC 320 C19 inputs on the front of the power supply. Both power cords must be connected for the power supply to operate properly, and both power cords require a dedicated 20 A 110 VAC source power connection.

The 110 VAC power supply ships with two L5-20P (locking) power cable.

Power supplies slide in from the front of the chassis, as illustrated in Figure 100.

Figure 100: 110 VAC power supplies in a BlackDiamond 6808 or a BlackDiamond 6804

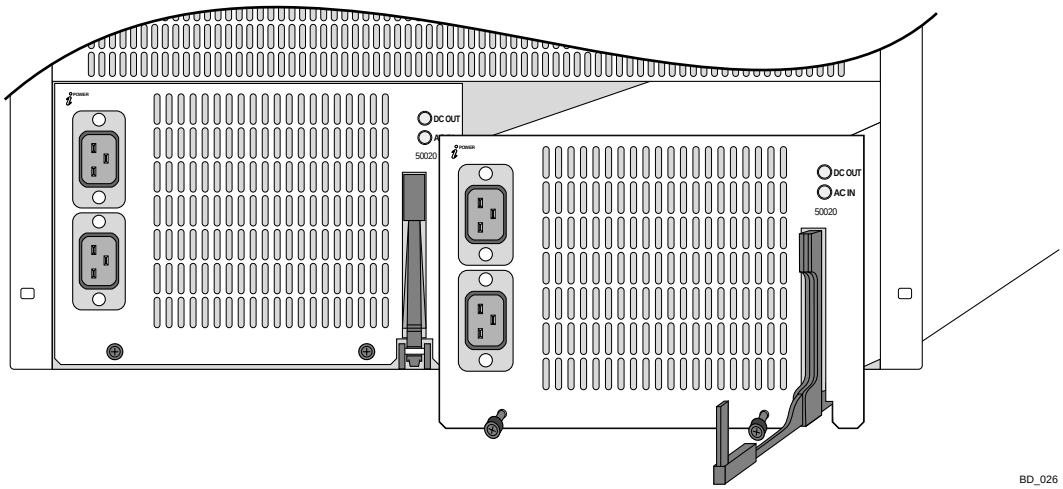


Table 58 describes the LED activity on the 110 VAC power supply

Table 58: 110 VAC power supply LED activity

LED	Color	Indicates
AC In	Green	Powered using both inputs
	Amber	Powered using only one input, or input voltage is less than 100 V
	Off	No input power

Table 58: 110 VAC power supply LED activity (continued)

LED	Color	Indicates
DC Out	Green	All DC outputs are operational
	Amber	One or more DC outputs failed
	Off	No power

DC Power Supplies

The DC inputs are located on the front of the power supply. Each set of power terminals on the DC power supply consists of two 6-mm, metric-threaded, nickel-plated, brass studs that are centered 0.625 inch (15.86 mm) apart. The earth ground studs extend 0.52 inch (13.2 mm) above the power supply faceplate; the set of positive (+) and negative (–) studs extend 0.9 inch (22.9 mm) above the faceplate. The nickel plating on the studs enhances conductivity and resists corrosion. The input terminals are isolated from the ground terminals. The BlackDiamond DC power supplies operate with DC input that can range from -42 to -70 V. Each DC power supply requires a dedicated 60 A service.

The DC power supply ships with the input lugs attached to the power supply, and the power supplies slide in from the front of the chassis, as illustrated in Figure 101.

For centralized DC power connections, install only in a restricted access area.

Figure 101: DC power supplies in a BlackDiamond 6808 or a BlackDiamond 6804

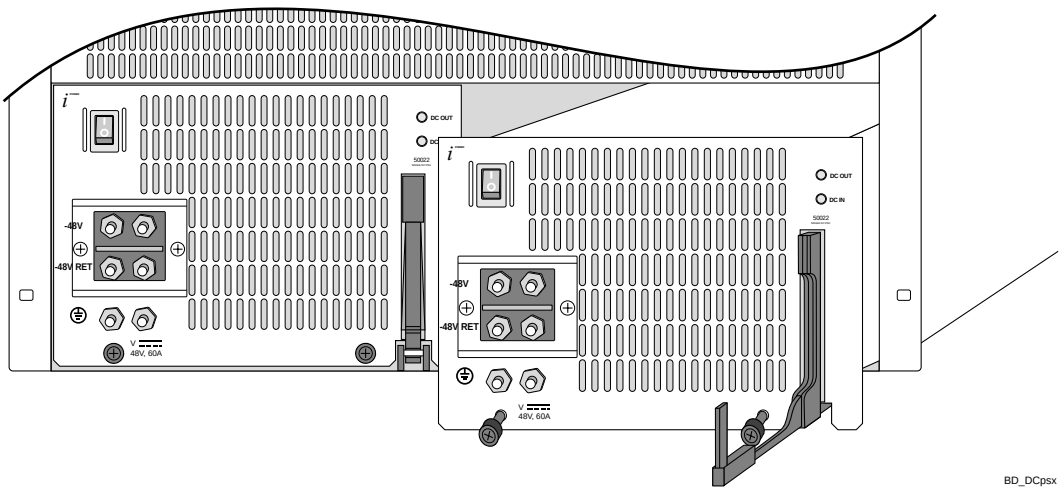


Table 59 describes the LED activity on the DC power supply

Table 59: DC power supply LED activity

LED	Color	Indicates
DC in	Green	Input voltage is within range
	Amber	Input voltage is outside of range
	Off	Input voltage is below 12 V

Table 59: DC power supply LED activity (continued)

LED	Color	Indicates
DC out	Green	All DC outputs are operational
	Amber	One or more DC outputs have failed
	Off	Input voltage is below 12 V

Installing a BlackDiamond 6800 Series Power Supply

You need the following tools and equipment to install the BlackDiamond 6800 series power supplies:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Power supply

NOTE

Ground the rack, mount the chassis in a rack, and ground the chassis before installing any switch components. For more information about grounding the rack, see "Protective Grounding for the Rack" on page 52. For more information about grounding the chassis, see "Grounding the BlackDiamond 6800 Series Chassis" on page 209.

To install a power supply:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. If there is a blank faceplate covering the power supply bay, remove it and save it for future use.
3. For the BlackDiamond 6816 switch, ensure that the power supply is right side up, as shown in Figure 102, and the locking handle is open.

   For the BlackDiamond 6808 or Black Diamond 6804 switch, ensure that the power supply is right side up, as shown in Figure 103, and the locking handle is open.

Figure 102: Installing a DC power supply in a BlackDiamond 6816

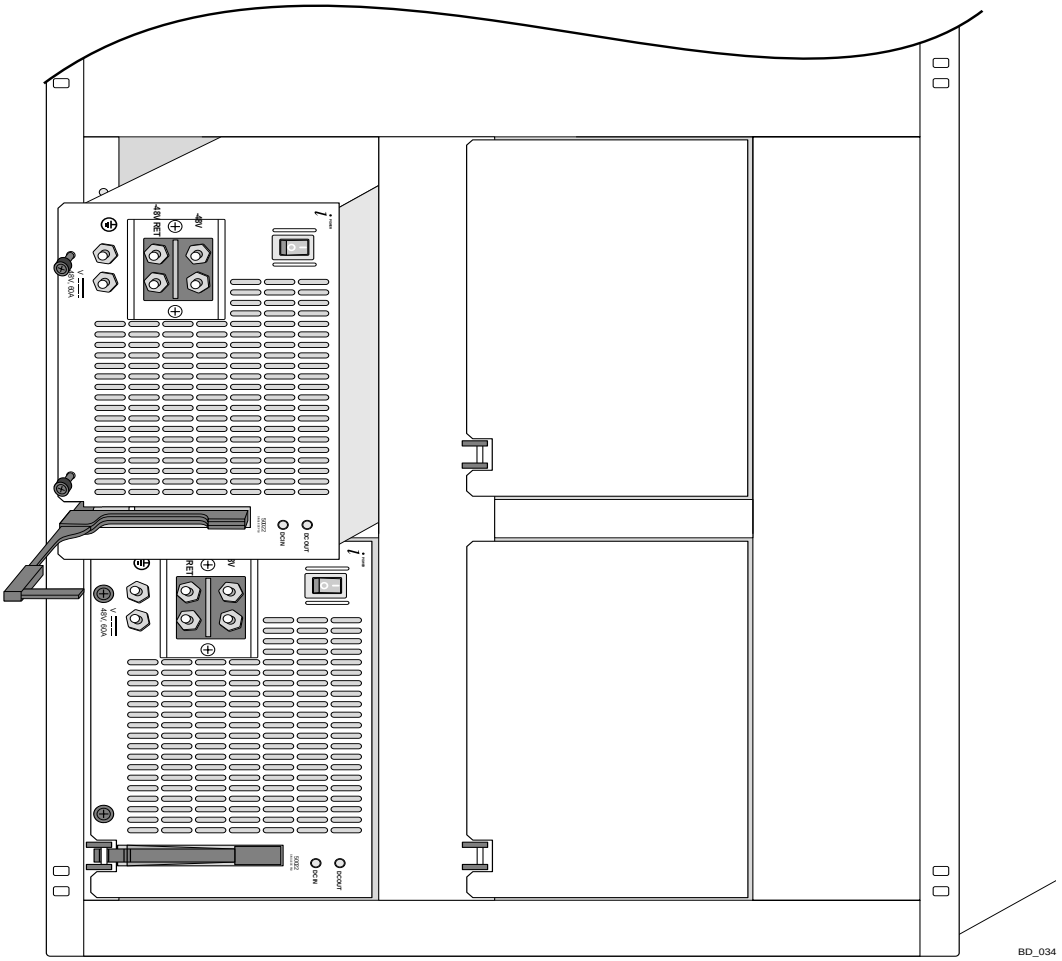
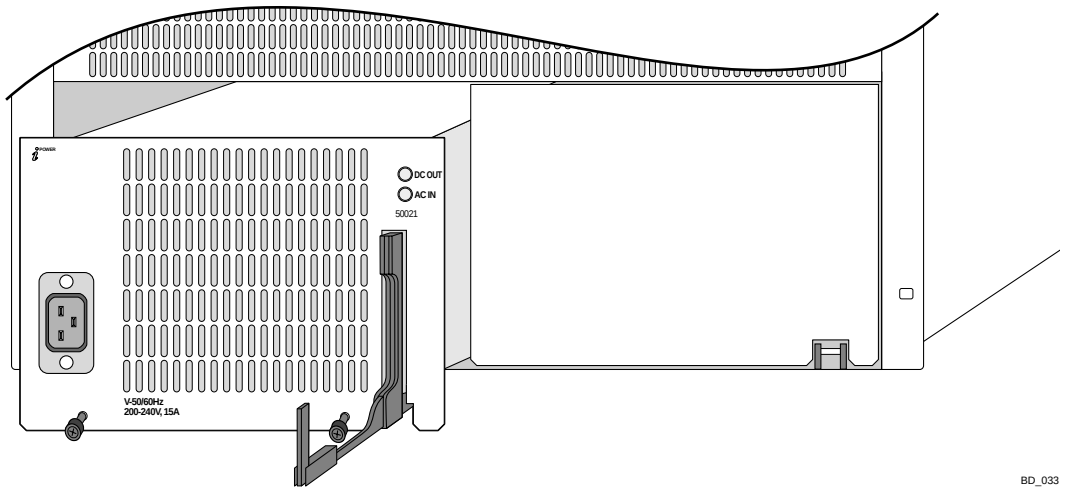


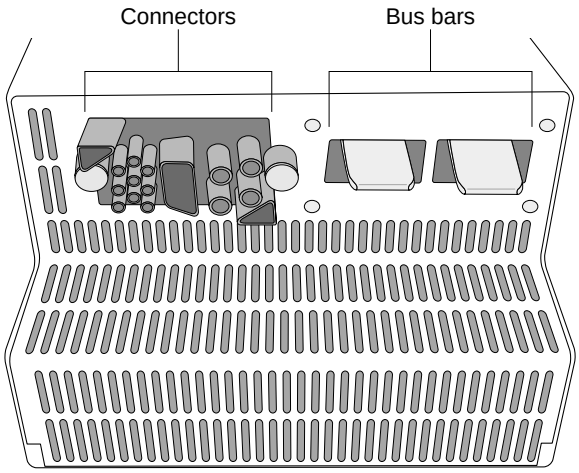
Figure 103: Installing an AC power supply in a BlackDiamond 6808 or a BlackDiamond 6804



CAUTION

Do not handle the power supply using the DC output bus bars. Support the power supply from the bottom, while holding the handle on the front of the power supply unit.

Figure 104: DC output bus bars and connectors on a BlackDiamond power supply



4 If you are installing a DC power supply, you must prepare the DC power supply cable before you install the power supply. See “Preparing the DC Cabling” on page 219 for more details. A DC power supply in the BlackDiamond 6816 switch is shown in Figure 102.

5 To support the power supply, place both hands under the power supply to check the connectors for dust and packing materials.

6 Gently begin to slide the power supply into the power supply bay.

CAUTION

Do not slam the power supply into the backplane. Use the locking handle to secure the power supply unit into the chassis.

7 Secure the power supply in a BlackDiamond 6816 by pushing right on the locking handle until it clicks in place.

Secure the power supply in a BlackDiamond 6808 or BlackDiamond 6804 by pushing down on the locking handle until it clicks in place.

8 Tighten the screws using a #1 Phillips screwdriver.

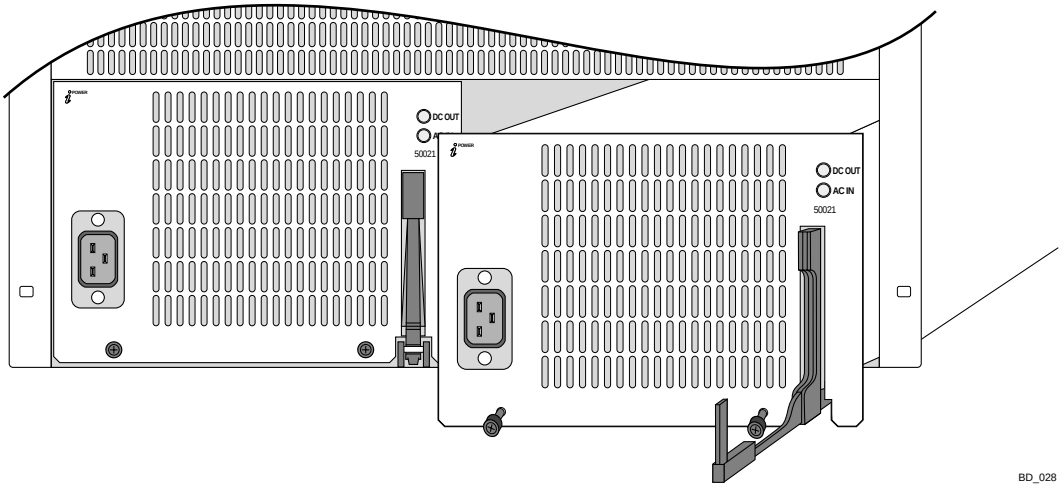
9 To turn on power to the system, connect the power cables to the power supplies and then to the wall outlet.

If you have a DC power supply, remove the plexiglass cover, attach the power cables, and turn the on/off switch to the on position. See “Attaching the DC Cabling” on page 220 for more information about how to attach the DC cabling to the power supply.

10 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To install additional power supplies, repeat steps 1 through 9.

Figure 105: Installing a second power supply in a BlackDiamond 6808 or a BlackDiamond 6804



AC Power Cable and Plug

Use the appropriate AC power cable and plug for your switch and your location. See “Wiring Closet Considerations” on page 43 for more information about the types of power cords to use.

Figure 106 shows the BlackDiamond 6800 series 220 VAC power cable and plug.

Figure 106: BlackDiamond 220 VAC power cable and plug

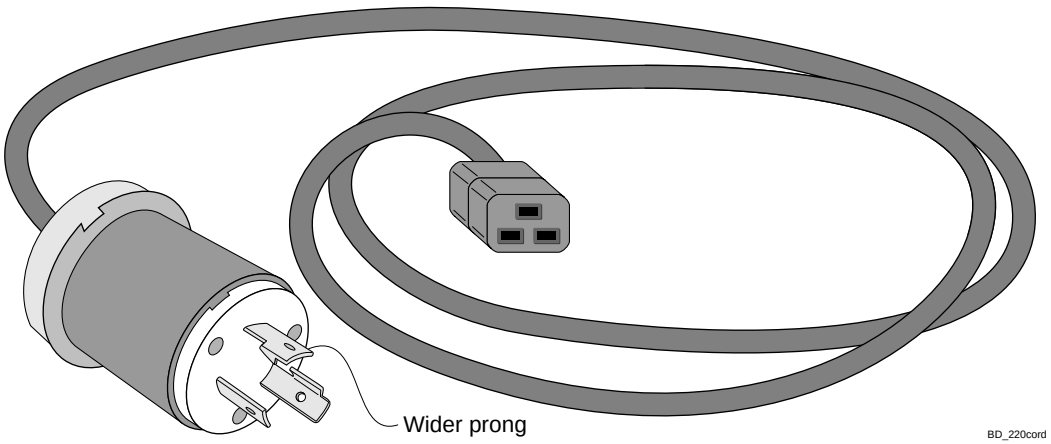
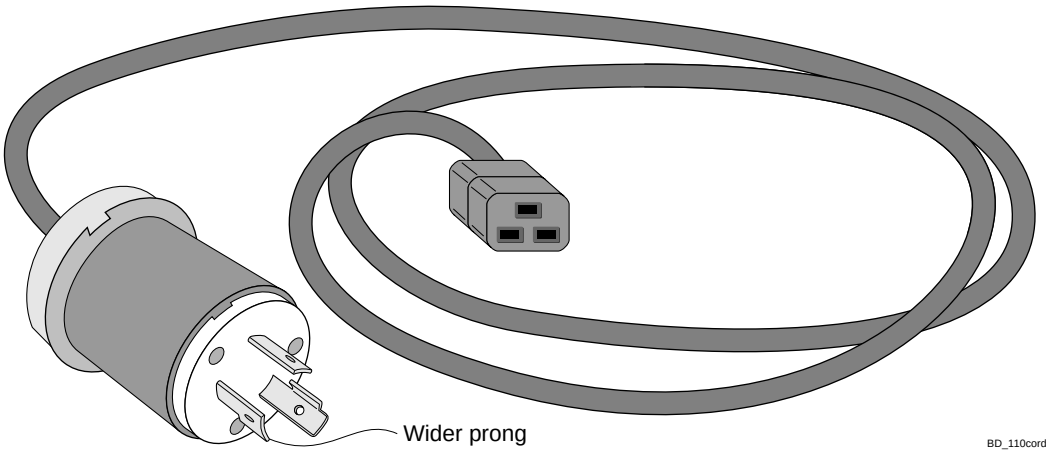


Figure 107 shows the BlackDiamond 6800 series 110 VAC power cable and plug.

Figure 107: BlackDiamond 110 VAC power cable and plug



See “Preparing the DC Cabling” on page 219 for details about the -48 VDC power cable and plug.

Selecting the DC Cabling

Use the following guidelines when selecting cabling for the DC power supplies:

- Each DC power supply requires dedicated 55 A service.
- For DC power cables, use 4 AWG, high-strand-count copper wire cable.

Preparing the DC Cabling

Use the following guidelines when preparing cabling for the DC power supplies:

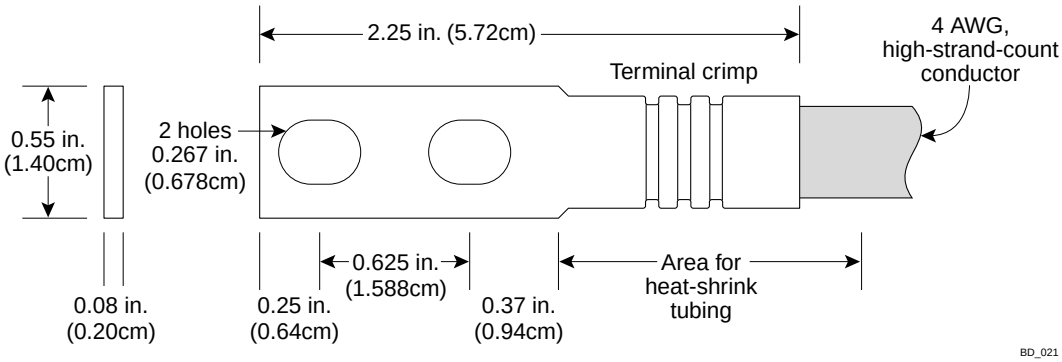
- Each DC power supply requires dedicated 60 A service.
- For DC power cables, use 4 AWG, high-strand-count copper wire cable with dual hole lugs that fit over M6 (metric) terminals that are centered 0.625 inch (15.86 mm) apart.
- For convenience, the lock washers and nuts that you use to connect the source DC cables to the power terminals are loosely mounted on the studs of the DC power supply.

NOTE

Add a length of heat-shrink tubing to prevent the crimp area on the lug from coming into contact with the metal faceplate of the DC power supply.

Figure 108 shows the specifications of the lug that is used to connect the DC power cable to the DC power supply.

Figure 108: Dimensions of the DC power cable lugs



Use power cables and lugs with the specifications outlined in Table 60.

Table 60: Source DC power specifications

Characteristic	Specification
DC power cable size	4 AWG, high strand-count copper wire
DC power cable lug	Panduit copper, standard barrel, 2-hole lug—Type LDC (Panduit part number: LCD4-14A-L; Thomas & Betts part number: LCN4-14).
Power	1800 W, -42 to -70 VDC

Attaching the DC Cabling

To attach the cable to the lugs, perform the following steps:

1 Strip 0.5 inches of insulation from the 4 AWG, high strand-count copper wire cable.

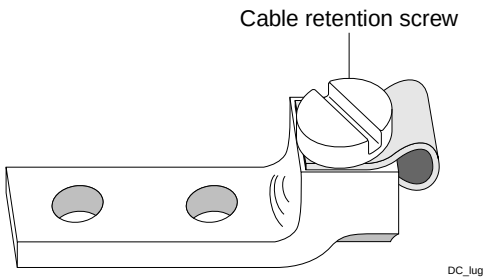
2 Insert the cable into the cable lugs.

CAUTION

Ensure that no copper is visible between the lug and the cable insulation

3 Tighten the cable retention screw, using a $^{1}/_{4}$" or $^{5}/_{16}$" flathead screwdriver, to 20 in-lbs of torque. The cable retention screw is shown in Figure 109.

Figure 109: 2-stud lug



Each set of power terminals on the DC power supply consists of two 6-mm, metric-threaded, nickel-plated, brass studs centered 0.625 inch apart. The earth ground studs extend 0.52 inch (13.2 mm) above the power supply faceplate; the set of positive (+) and negative (–) studs extend 0.9 inch

(22.9 mm) above the faceplate. The nickel plating on the studs enhances conductivity and resists corrosion.

For convenience, the lock washers and nuts for connecting the source DC cables to the power terminals are loosely mounted on the studs ready for use.

Verifying a Successful Installation

After you supply power to the BlackDiamond switch, each MSM64i performs a POST of its circuitry. The LED labeled "SYS" on the MSM64i blinks amber during the POST. After the MSM64i has passed its POST and is operational, each I/O module performs its own POST.

NOTE

See Chapter 15, "BlackDiamond 6800 Series Management Switch Module" for more information about switch management module LED activity and Chapter 16, "BlackDiamond 6800 Series I/O Modules" for more information about I/O module LED activity.

Removing a BlackDiamond 6800 Series Power Supply

BlackDiamond 6800 series power supplies are hot-swappable. You can add or remove power supplies without turning off power to the chassis and normal operation will continue was long as the switch has enough power to support the installed modules. If you have three or more power supplies installed in a BlackDiamond 6818 or two or more power supplies installed in a BlackDiamond 6808 or BlackDiamond 6804, you can remove one of them without turning off power to the chassis.

You need the following tools and equipment to remove the BlackDiamond 6800 series power supplies:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement power supply

To remove a 110 VAC, 220 VAC, or -48 VDC power supply:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. Completely remove the power supply cable(s) from the wall outlet and then from the power supply. If you have a DC power supply, turn the on/off switch to the off position and remove the power cables.
3. Unscrew the power supply using a #1 Phillips screwdriver.
4. On a BlackDiamond 6816, disengage the power supply by rotating the handle out and to the left, as shown in Figure 110.

   On a BlackDiamond 6808 or BlackDiamond 6804, disengage the power supply by rotating the handle out and down, as shown in Figure 111.

Figure 110: Removing BlackDiamond 6816 DC power supplies

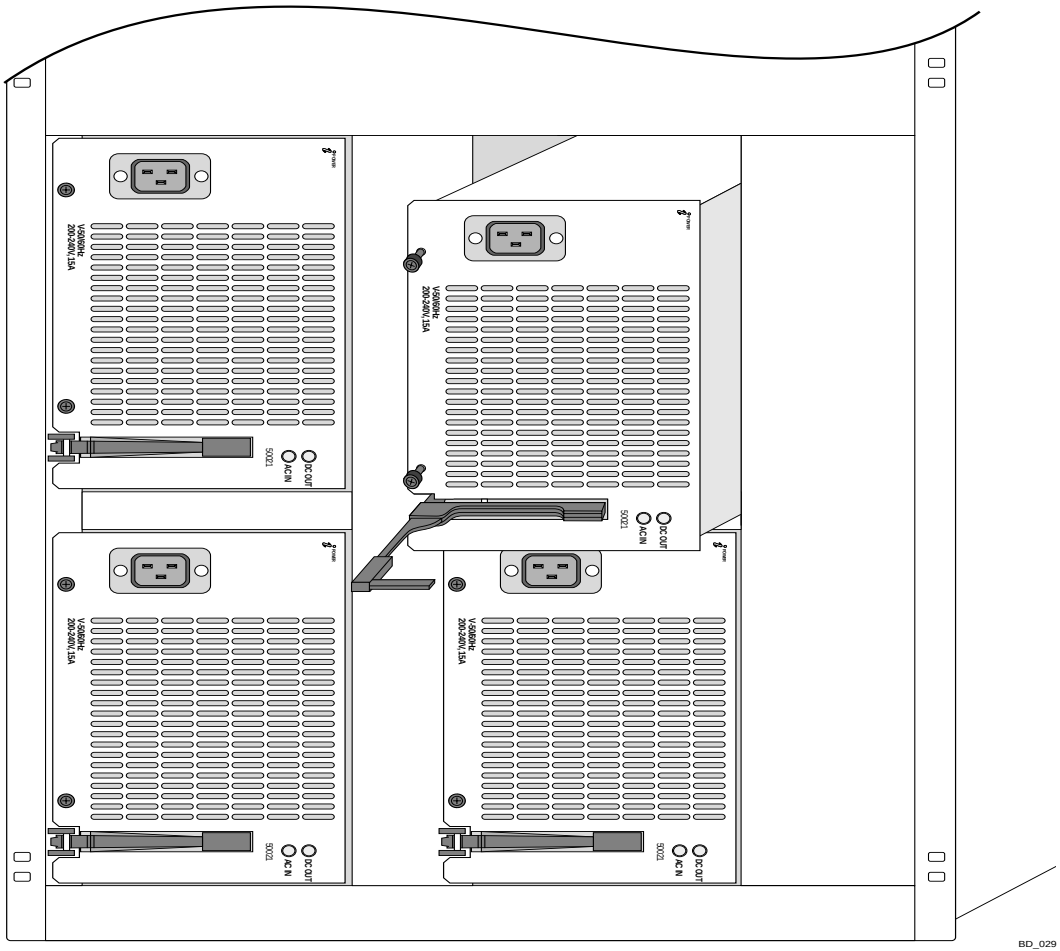
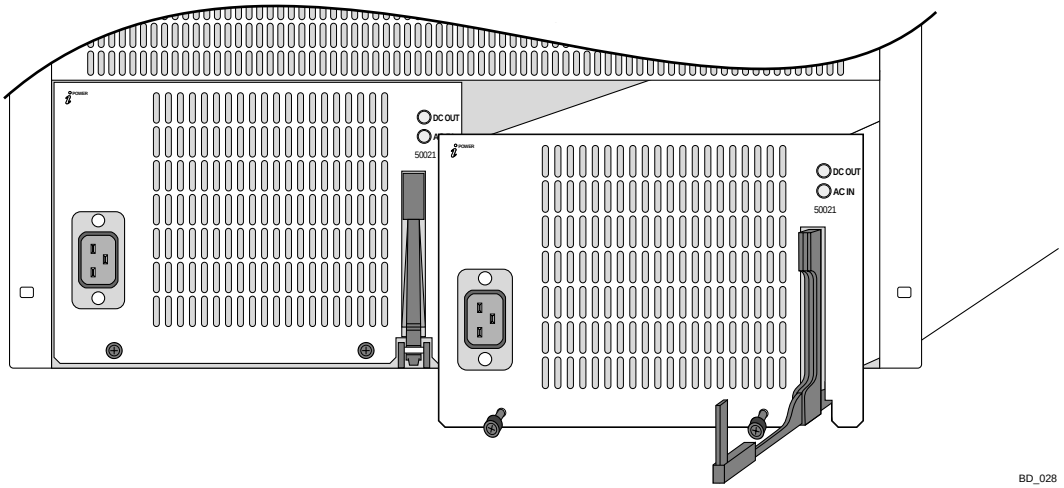


Figure 111: Removing BlackDiamond 6808 or BlackDiamond 6804 220 VAC power supplies



5 Slowly slide the power supply out of the chassis by grasping the edges of the power supply with both hands and pulling the power supply towards you. After you pull the power supply towards you, place both hands underneath the power supply to support it as you pull it out of the chassis.

CAUTION

The power supply weighs approximately 30 pounds (14 kg).

CAUTION

Do not handle the power supply using the DC output bus bars.

6 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

15 BlackDiamond 6800 Series Management Switch Module

This chapter describes:

- Installing MSM64i Modules on page 229
- Removing MSM64i Modules on page 232

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove the BlackDiamond Management Switch Fabric Module (MSM64i).

The Management Switch Fabric Module (MSM64i) is the internal switch fabric for data that is being sent between I/O modules. One MSM64i is required for switch operation; however, adding more MSM64i modules increases both reliability and throughput. Each MSM64i has two CPUs for protocol processing and network management. For full redundancy, you can install up to four MSM64i modules in the BlackDiamond 6816 switch and up to two MSM64i modules in the BlackDiamond 6808 or BlackDiamond 6804 switch. With full redundancy, the BlackDiamond 6800 series switch is a fully nonblocking switch.

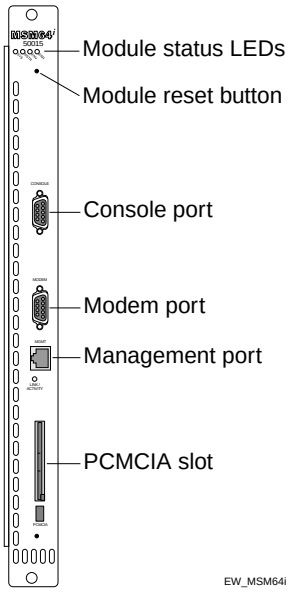
Table 61 shows that packet throughput between I/O modules increases when additional MSM64i modules are installed.

Table 61: Packet throughput between I/O modules

Chassis	# of MSM64i Modules	Throughput
BlackDiamond 6816	1	64 Gbps
	2	128 Gbps
	3	192 Gbps
	4	256 Gbps
BlackDiamond 6808	1	64 Gbps
	2	128 Gbps
BlackDiamond 6804	1	32 Gbps
	2	64 Gbps

You can install the MSM64i in one of the designated (lettered) slots in the BlackDiamond 6800 series chassis, labeled slot A, B, C, or D on the BlackDiamond 6816 or slot A or B on the BlackDiamond 6808 and the BlackDiamond 6804. Figure 112 shows the MSM64i.

Figure 112: Management Switch Fabric Module 64 (MSM64i)



The MSM64i module consists of a printed circuit board mounted on a metal panel that acts as the insertion vehicle in a BlackDiamond 6800 series switch. The module carrier also includes ejector/injector levers and captive retaining screws at each end of the module front panel.

The MSM64i has the following ports:

- Console port—Used to connect a terminal and perform local management.
- Management port—Used to connect an Ethernet cable directly from your laptop into the management port to view and locally manage the switch configurations.
- Modem port—Used to connect a modem for remote access to the CLI.
- PCMCIA slot—Reserved for future use.

See Chapter 1, “Summary of Common Switch Features” for more information about management ports, and for more information about BlackDiamond MSM64i module specifications, see Appendix C, “Module Technical Specifications.”

MSM64i Activity

The BlackDiamond 6800 series switch can run with a single MSM64i installed. When you install additional MSM64i modules, one of the MSM64i modules operates as the *master*, and the others become the *slaves*.

The master MSM64i is responsible for upper-layer protocol processing and system management functions. For example, OSPF computation and SNMP functions are performed by the master MSM64i. Packet handling is distributed among the CPUs of all installed MSM64i modules.

When you save the switch configuration, it is saved to all MSM64i modules. If you download a new ExtremeWare image, the image is downloaded to all MSM64i modules.

Selection of the master MSM64i occurs automatically. The following scenarios describe the selection process:

- When the BlackDiamond 6800 series switch boots with one or more MSM64i modules already installed, and an MSM64i module is installed in slot A, the MSM64i in slot A becomes the master.
- When the BlackDiamond 6800 series switch boots with a single MSM64i (regardless of the slot position), it is selected as the master. If additional MSM64i modules are added to the switch after powered on, the added MSM64i modules become the slaves. MSM64i modules that operate as slaves can be inserted and removed without disrupting network services.
- If you remove the master MSM64i while the BlackDiamond 6800 series switch is operating, the slave MSM64i experiences a soft reset and then becomes the master MSM64i. For example, if you have a BlackDiamond 6816 switch with a master MSM64i in slot A and slave MSM64i modules in slots B through D, and you remove the master MSM64i from slot A, the slave in slot B becomes the master. Later, if you need to remove the master MSM64i from slot B, the slave in slot C becomes the master.

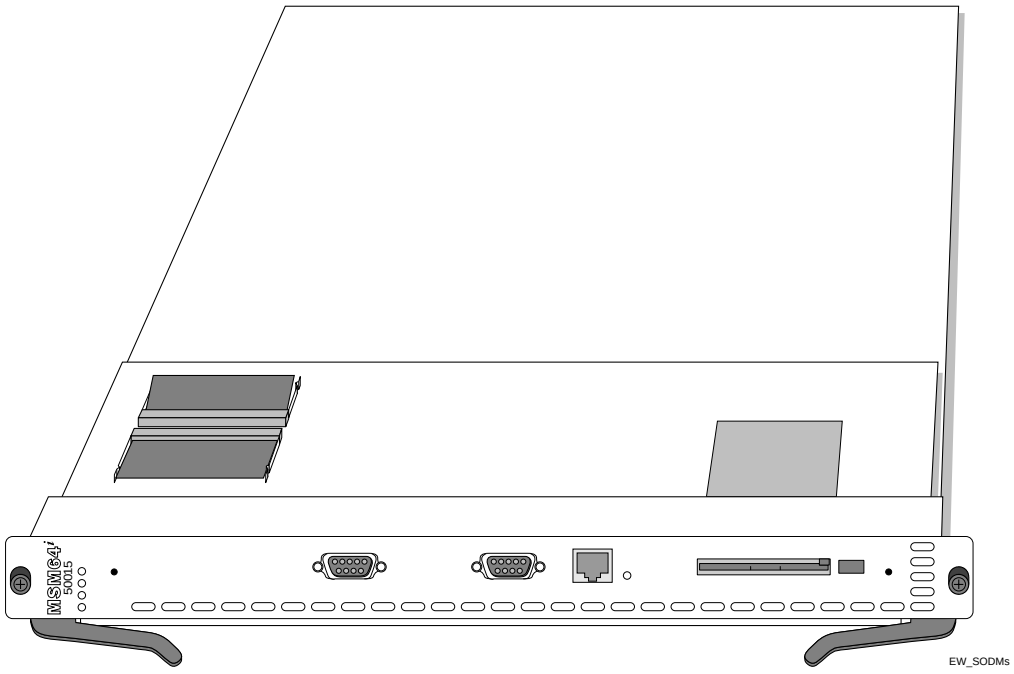
MSM64i Memory

The MSM64i has two 144-pin SODIMM sockets and ships with two 128 MB SODRAM modules installed, as shown in Figure 113.

NOTE

The MSM64i supports only SODIMMs supplied by Extreme Networks.

Figure 113: MSM64i SODIMM sockets



The MSM64i can be populated with any of the memory combinations that are listed in Table 62. If you are using multiple MSM64i modules, all modules must have identical memory configurations.

Table 62: MSM64i SODIMM memory combinations

J8	J9	Total Memory
64 MB	64 MB	128 MB
128 MB	0 MB	128 MB
128 MB	64 MB	192 MB
128 MB	128 MB	256 MB

NOTE

See "Adding SODIMMs to the MSM64i Module" on page 231 and "Removing a SODIMM from the MSM64i Module" on page 232 for more details on how to add and remove SODIMMs.

MSM64i LEDs

Table 63 describes the LED activity on the MSM64i.

Table 63: MSM64i LEDs

LED	Color	Indicates
SYS	Green blinking	Normal operation is occurring
	Amber blinking	Diagnostic test is in progress
	Amber	Diagnostic failure has occurred
	Off	Switch is not receiving power
MSTR	Green	Module is operating as master
	Amber	Module is operating as slave
ENV	Green	Environment (temperature, fan, power supply) is operating properly
	Amber	Environmental failure has occurred
ERR	Amber	A critical software error has been logged since power up
	Off	Normal operation is occurring
Link/Activity	Off	Link is down
	Green	Link is up
	Amber	Packet activity is occurring

NOTE

To reset the critical software error LED (amber ERR LED), use the `clear log static` *command and reboot the switch. If you continue to have critical software errors, or the ERR LED is amber after the* `clear log static` *command and a switch reboot, contact Extreme Networks Customer Support.*

Installing MSM64i Modules

The BlackDiamond MSM64i module is hot-swappable. You do not need to power off the system to insert an MSM64i module.

You need the following tools and equipment to install an MSM64i module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- MSM64i module

To install the MSM64i:

1 Select a slot for the module:

- Slots A through D in the BlackDiamond 6816
- Slots A through B in the BlackDiamond 6808 and BlackDiamond 6804

CAUTION

You can install MSM64i modules only in slots A through D in the BlackDiamond 6816 or slots A through B in the BlackDiamond 6808 and BlackDiamond 6804. MSM64i modules do not fit in numbered slots. Forceful insertion can damage the MSM64i module.

2 Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.

3 Remove the blank faceplate from the slot to make room for the module, if applicable.

NOTE

Any unoccupied module slot in the chassis should have a blank faceplate installed to ensure satisfactory protection from EMI and to guarantee adequate airflow through the chassis.

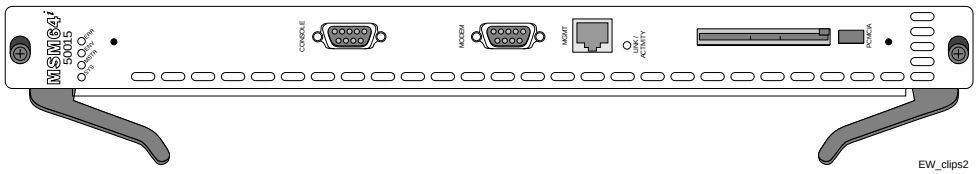
4 Grasp the module by its front panel with one hand, and place your other hand under the edge of the metal panel to support the weight of the module. Check the connectors for dust and packing materials.

CAUTION

To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

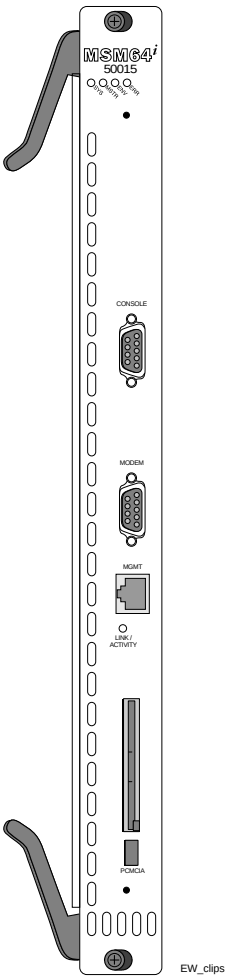
5 For the BlackDiamond 6816 and the BlackDiamond 6804, ensure that the MSM64i is horizontal with the module name to the left, the PCB on top, and that the ejector/injector levers are extended, as shown in Figure 114.

Figure 114: MSM64i prior to insertion in a BlackDiamond 6816 or a BlackDiamond 6804



For the BlackDiamond 6808, ensure that the MSM64i is vertical with the module name at the top, the PCB to the right, and that the ejector/injector levers are extended, as shown in Figure 115.

Figure 115: MSM64i prior to insertion in a BlackDiamond 6808



a Slide the MSM64i into the appropriate slot of the chassis (slot A, B, C, or D in the BlackDiamond 6816 or slot A or B in the BlackDiamond 6808 and BlackDiamond 6804), until it makes contact with the backplane.

NOTE

Use the metal panel, not the PCB, to guide the MSM64i.

As the MSM64i begins to seat in the chassis, the ejector/injector levers begin to close.

b To close the ejector/injector levers, use both hands simultaneously to push the handles toward the center of the module.

c To secure the module, tighten the two screws with a #1 Phillips screwdriver.

NOTE

Tighten the screws of this module before *you insert additional modules. Otherwise, you might unseat modules that you have not secured.*

d If you install a slave MSM64i, use the `synchronize` command to replicate all saved images and configurations from the master MSM64i to the slave MSM64i.

CAUTION

Depending on the size and complexity of your network, you should install and configure a slave MSM64i module when there will be minimal network disruption. You may need to reboot your switch after you use the `synchronize` *command.*

6 Store the module packaging for future use.

7 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To install additional MSM64i modules, repeat steps 1 through 6.

Verifying the MSM64i Module Installation

After you install the MSM64i module, verify that it is working correctly. Check the LEDs on the front panel of the MSM64i module. If the MSM64i module is operating normally, the front-panel LED indicators should appear as follows:

- SYS LED—green blinking
- MSTR LED:
  - Green: Operating as master
  - Amber: Operating as slave
- ENV—green
- ERR—off
- Link / Activity:
  - Green: Link is up
  - Amber: Packet activity is occurring

For more information about MSM64i module LED activity, see “MSM64i LEDs” on page 228.

Adding SODIMMs to the MSM64i Module

The MSM64i supports only SODIMMs from Extreme Networks.

To add a SODIMM to the MSM64i:

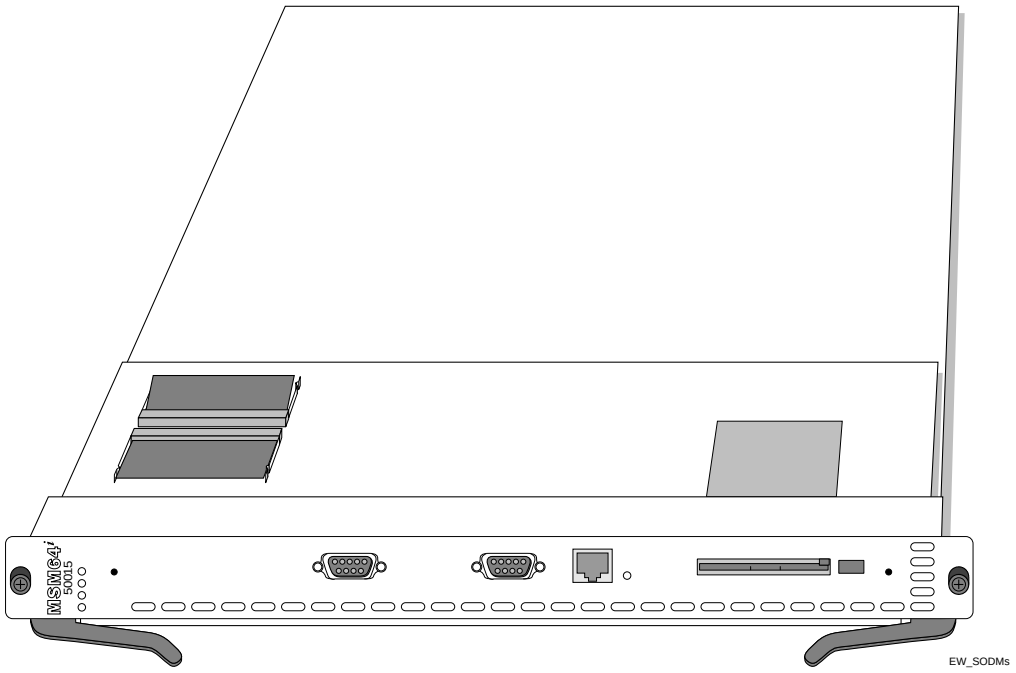
1 Attach an ESD strap to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.

2 Locate the SODIMM sockets on the MSM64i.

3 Position the SODIMM in the socket by ensuring that the gold fingers of the SODIMM slip into the connector and the keying notches align.

4 Secure the SODIMM by pressing down firmly until it is locked into the socket and the ejector locks rotate into position, as shown in Figure 116.

Figure 116: Adding a SODIMM to the MSM64i



Removing a SODIMM from the MSM64i Module

To remove a SODIMM:

1. Attach an ESD strap to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. Disengage the SODIMM by pulling out on the ejector locks that are located on either side of the SODIMM.
3. Rotate the SODIMM out of the socket.

Removing MSM64i Modules

The BlackDiamond MSM64i module is hot-swappable. You do not need to power off the system to remove a module.

You need the following tools and equipment to remove an MSM64i module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement MSM64i module

To remove an MSM64i module:

1. Attach an ESD strap to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. To loosen the module, unscrew the screws with a #1 Phillips screwdriver.

3 Simultaneously rotate the ejector/injector levers outward to disengage the module from the backplane.

   a Grasp the module front panel with one hand, and place your other hand under the metal panel to support the weight of the module.

CAUTION

To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

   b Slide the module out of the chassis and place it immediately into an antistatic sack to protect it from ESD damage and to prevent dust from collecting on the module's connectors.

4 If you are going to install a replacement MSM64i, follow the MSM64i module installation procedure on page 229.

5 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To remove additional MSM64i modules, repeat steps 1 through 4.

16 BlackDiamond 6800 Series I/O Modules

This chapter describes:

- Configuring I/O Modules on page 235
- Installing I/O Modules on page 272
- Removing I/O Modules on page 275

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any BlackDiamond I/O modules.

BlackDiamond I/O modules consist of a printed circuit board mounted on a metal panel that acts as the insertion vehicle in a BlackDiamond 6800 series switch. The module carrier also includes ejector/injector levers and captive retaining screws at each end of the module front panel.

For more information about BlackDiamond I/O module specifications, see Appendix C, "Module Technical Specifications."

Configuring I/O Modules

No configuration information is stored on the I/O modules; all configuration information is stored on the MSM64i module(s).

When the BlackDiamond 6800 series switch is powered on, ExtremeWare generates a default configuration for any slots that contain I/O modules. The default configuration allows the I/O module ports to participate in the VLAN named *default*. The default configuration for the I/O module is not preserved unless you explicitly save the configuration to nonvolatile RAM (NVRAM).

You can configure parameters of the I/O module after it is installed or you can pre-configure a slot for a certain type of module and configuration. The pre-configured information is applied to the module after it is inserted. If you pre-configure a slot for a specific module type, and then insert a different type of module, the module reverts to its default configuration.

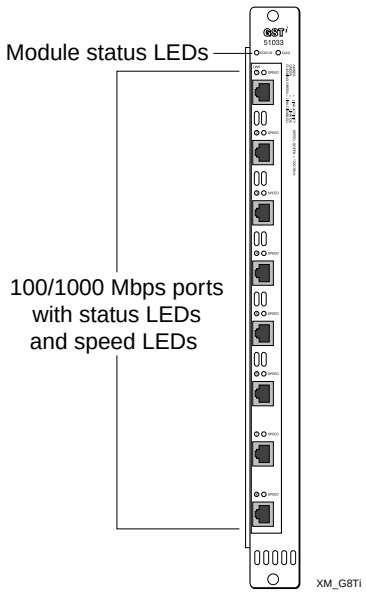
NOTE

See the ExtremeWare Software User Guide *and the* ExtremeWare Command Reference Guide *for more information about configuring I/O modules.*

G8Ti Module

Figure 117 shows the G8Ti module.

Figure 117: G8Ti module



The G8Ti module has eight autosensing 100/1000BASE-T ports that use standard RJ-45 connectors. The default configuration of the G8Ti module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in auto-negotiation mode.

LEDs

The G8Ti module has the following LEDs:

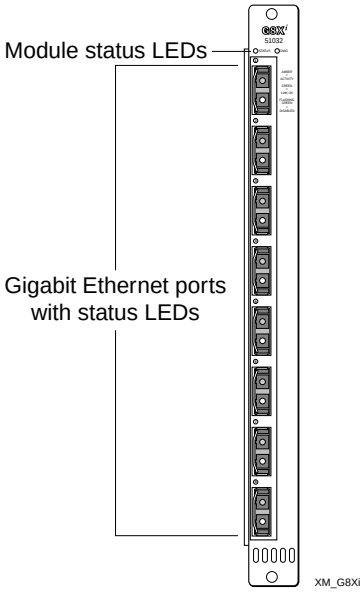
- Module status
- Port status
- Port speed

For information about the LEDs and their activity on the G8Ti module, see “I/O Module LEDs” on page 271.

G8Xi Module

Figure 118 shows the G8Xi module.

Figure 118: G8Xi module



The G8Xi module has eight unpopulated GBIC-based Gigabit Ethernet ports.

All Gigabit Ethernet ports on these modules use standard GBIC connectors and support 1000BASE-SX, 1000BASE-LX, 1000BASE-LX70, and 1000BASE-ZX. The default configuration of the G8Xi module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in auto-negotiation mode.

GBIC Ports

The G8Xi module supports any of the following GBICs:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LX70
- ZX GBIC
- LX100 GBIC
- UTP GBIC

GBIC Media Types and Distances. Table 64 describes the media types and associated maximum distances for each GBIC type.

Table 64: GBIC types and maximum distances

Standard	Media Type	Mhz•Km Rating	Maximum Distance (Meters)
SX (850 nm optical window)	50/125 µm multimode fiber	400	500
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	160	220
	62.5/125 µm multimode fiber	200	275
LX (1310 nm optical window)	50/125 µm multimode fiber	400	550
	50/125 µm multimode fiber	500	550
	62.5/125 µm multimode fiber	500	550
	10/125 µm single-mode fiber	–	5,000
	10/125 µm single-mode fiber*	–	10,000
ZX (1550 nm optical window)	10/125 µm single-mode fiber	–	50,000
ZX Rev 03 (1550 nm optical window)	10/125 µm single-mode fiber		70,000
LX70 (1550 nm optical window)	10/125 µm single-mode fiber	–	70,000
LX100 (1550 nm optical window)	10/125 µm single-mode fiber		100,000
UTP	Category 5 UTP cable	–	80

*Extreme Networks proprietary. Connections between two Extreme Networks 1000BASE-LX interfaces can use a maximum distance of 10,000 meters.

NOTE

For more information about the supported GBIC types, see “GBIC Specifications” on page 32.

LEDs

The G8Xi module has the following LEDs:

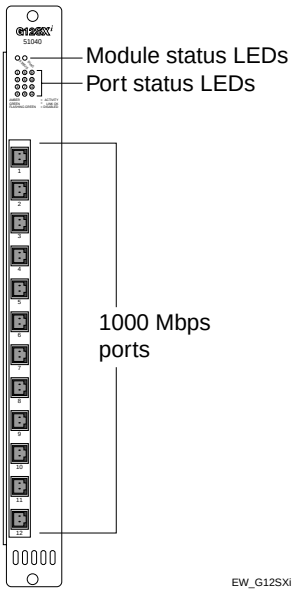
- Module status
- Port status

For information about the LEDs and their activity on the G8Xi module, see “I/O Module LEDs” on page 271.

G12SXi Module

Figure 119 shows the G12SXi module.

Figure 119: G12SXi module



The G12SXi module has 12 Gigabit Ethernet ports that use standard MT-RJ connectors, and supports 1000BASE-SX only. The default configuration of the G12SXi module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in auto-negotiation mode.

LEDs

The G12SXi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the G12SXi module, see “I/O Module LEDs” on page 271.

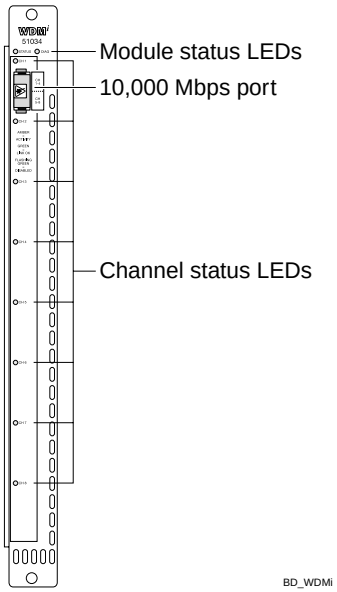
Software Requirements

The G12SXi module requires that you load ExtremeWare version 6.1.4 or later on the switch.

WDMi Module

Figure 120 shows the WDMi module.

Figure 120: WDMi module



The WDMi module has one 10 Gbps port, which supports eight full-duplex Gigabit Ethernet channels. The port transmits over a pair of single mode fiber cables using wavelength division multiplexing. The port uses an SC-APC duplex connector with a spring-loaded safety cover. APC connectors are polished at an 8˚ angle to minimize loss and reflections over extended transmit distances.

The default configuration of the WDMi module is as follows. The port:

- Is added to the default VLAN as untagged.
- Inherits the properties of the default VLAN (protocol type, VLANid, and so forth).

The WDMi module transmits bi-directionally on both fiber cables and then multiplexes these wavelengths over the single-mode optical fiber.

Table 65 describes the specifications for the WDMi optical interface.

Table 65: WDMi optical interface specifications

Parameter	Minimum	Typical	Maximum
Transmitter			
Optical output power	-5 dBm	-3 dBm	-1 dBm
Channel 1 wavelength	1495 nm	1501 nm	1507 nm
Channel 2 wavelength	1515 nm	1521 nm	1527 nm
Channel 3 wavelength	1535 nm	1541 nm	1547 nm
Channel 4 wavelength	1555 nm	1561 nm	1567 nm
Receiver			
Optical input power sensitivity	-17 dBm		

Table 65: WDMi optical interface specifications (continued)

Parameter	Minimum	Typical	Maximum
Optical input power maximum			-1 dBm
Fiber Optic Cable			
Back reflection			-25 dB

Extreme Networks recommends that you reserve 3 dB for losses due to cable splices, connectors, and operating margin. Table 66 describes the cable attenuation, cable budget, and operating distance for a variety of cable attentuation ratings for the WDMi module

Table 66: WDMi maximum transmit distances

Cable Attenuation	Cable Budget	Maximum Distance
0.20 dB/km	9 dB	45 km
0.25 dB/km	9 dB	36 km
0.30 dB/km	9 dB	30 km

A minimum of 2 dB attenuation is required to prevent saturation of the receiver.

LEDs

The WDMi module has the following LEDs:

- Module status
- Channel status

For information about the LEDs and their activity on the WDMi module, see “I/O Module LEDs” on page 271.

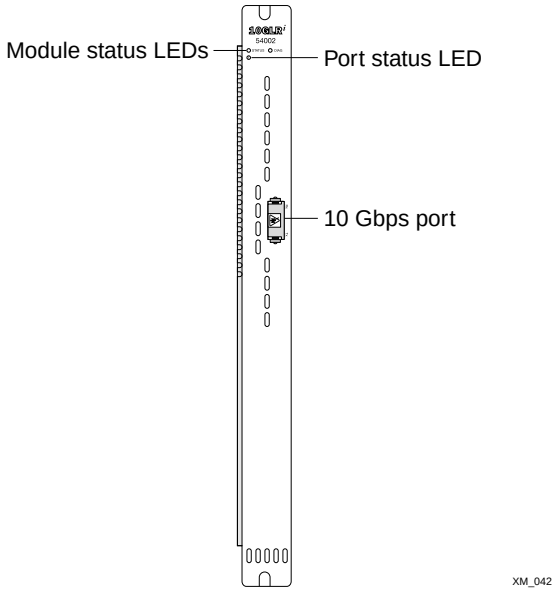
Software Requirements

The WDMi module requires that you load ExtremeWare version 6.1.5 or later on the switch.

10GLRi module

Figure 121 shows the 10GLRi module.

Figure 121: 10GLRi module



The 10GLRi module has one 10GBASE-LR port that supports single-mode fiber using standard SC connectors. The module has the bandwidth to blow through any bottleneck and has bandwidth management, traffic shaping, and policy-based QoS capabilities. The module is a single slot I/O module for the BlackDiamond 6808 chassis. No chassis upgrade is required, and the MSM64i modules support the 10GLRi module.

The default configuration of the module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in auto-negotiation mode.

When you install the fiber-optic cable using the SC connectors, be sure you hear a “click” as the cable is installed. This sound ensures that you have properly seated the connector and that it is completely latched in the port. If the cable is not fully inserted in the port, the link my have many errors and my not come up properly. You must use single-mode fiber-optic cable.

Table 67 summarizes the optical parameters for the 10GLRi module.

Table 67: 10GLRi optical parameters

Parameter	Value
Minimum launch power[1,2]	-6.2 dBm
Maximum receiver sensitivity[1]	-12.6 dB
Minimum extinction ratio	3.5 dB
Minimum distance	10 km

Table 67: 10GLRi optical parameters (continued)

Parameter	Value
Wavelength range	1260 to 1355 nm
Maximum overload average receive power	0.5 dB (average power)
Channel insertion loss	6.4 dB

1 This measurement uses the Optical Modulation Amplitude (OMA) test method; the absolute difference between an optical power logic level one and an optical power logic level zero.
2 This measurement includes the dispersive effects of the cable on the transmitter, known as Transmitted Dispersion Penalty (TDP).

Table 68 describes the power specifications for the 10GLRi module.

Table 68: 10GLRi power specifications

Volts	Amps	Watts
2.5	0	0
3.3	11	36
5	17	85

LEDs

The 10GLRi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the 10GLRi module, see “I/O Module LEDs” on page 271.

Software Requirements

The 10GLRi module requires that you load ExtremeWare 6.2.0TR 10GigE Technology Release on the switch.

Augmented Command. The automatic interface configuration command now includes a keyword to specify the 10 Gigabit Ethernet interface. To configure the automatic interface costs for 10 Mbps, 100 Mbps, 1 Gbps, and 10 Gbps interfaces, use the following command:

```
config ospf metric-table 10m <cost> 100m <cost> 1g <cost> 10g <cost>
```

Where <cost> specifies the interface cost.

The default cost settings for each interface are:

- 10 Mbps—10
- 100 Mbps—5
- 1 Gbps—4
- 10 Gbps—2

The following example configures the automatic interface costs for 10 Mbps, 100 Mbps, 1 Gbps, and 10 Gbps interfaces:

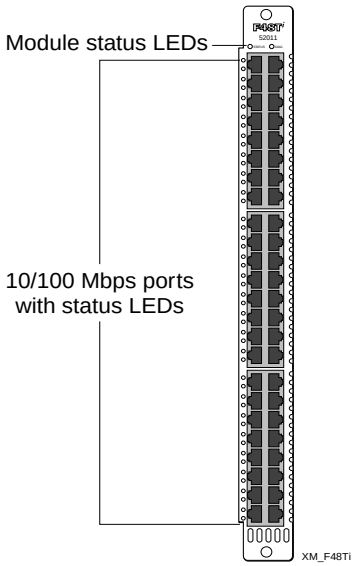
```
config ospf metric-table 10m 20 100m 10 1g 8 10g 4
```

For more information about this and other ExtremeWare commands, see the *ExtremeWare Software Command Reference Guide.*

F48Ti Module

Figure 122 shows the F48Ti module.

Figure 122: F48Ti module



The F48Ti has 48 autosensing 10BASE-T/100BASE-TX ports. All ports use standard RJ-45 connectors.

The default configuration of the F48Ti module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in auto-negotiation mode.

LEDs

The F48Ti module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the F48Ti module, see “I/O Module LEDs” on page 271.

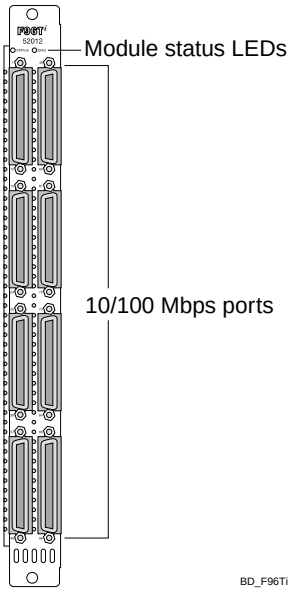
Software Requirements

The F48Ti module requires that you load ExtremeWare version 6.1.4 or later on the switch.

F96Ti Module

Figure 123 shows the F96Ti module.

Figure 123: F96Ti module



The F96Ti has 96 10BASE-T/100BASE-TX ports available through eight RJ-21 telco connectors. The RJ-21 port is shown in Figure 124.

Figure 124: One RJ-21 port yields 12 10/100 ports

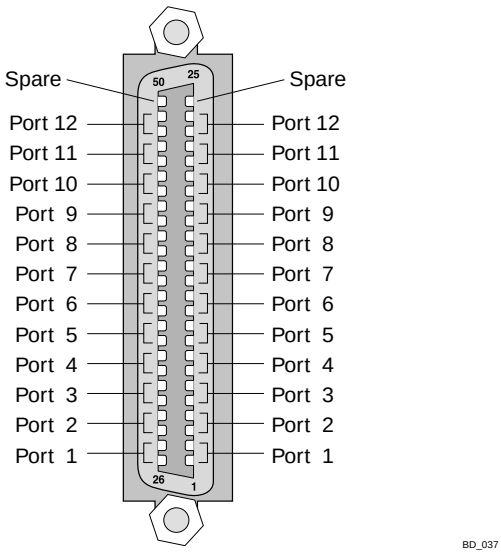


Table 69 describes the pinouts for the RJ-21 port.

Table 69: Connector pinouts for the RJ-21 port

RJ-45 Number	RJ-21 Pin Numbers	RJ-45 Pin Numbers
1	1, 2, 26, 27	2, 6, 1, 3
2	3, 4, 28, 29	2, 6, 1, 3
3	5, 6, 30, 31	2, 6, 1, 3
4	7, 8, 32, 33	2, 6, 1, 3
5	9, 10, 34, 35	2, 6, 1, 3
6	11, 12, 36, 37	2, 6, 1, 3
7	13, 14, 38, 39	2, 6, 1, 3
8	15, 16, 40, 41	2, 6, 1, 3
9	17, 18, 42, 43	2, 6, 1, 3
10	19, 20, 44, 45	2, 6, 1, 3
11	21, 22, 46, 47	2, 6, 1, 3
12	23, 24, 48, 49	2, 6, 1, 3

Table 70 describes the output signals for the RJ-21 connector.

Table 70: Output signals for the RJ-21 connector

RJ-21 Pin Numbers	Output Signal	RJ-21 Pin Numbers	Output Signal
1	RxD (-)	26	RxD (+)
2	TxD (-)	27	TxD (+)
3	RxD (-)	28	RxD (+)
4	TxD (-)	29	TxD (+)
5	RxD (-)	30	RxD (+)
6	TxD (-)	31	TxD (+)
7	RxD (-)	32	RxD (+)
8	TxD (-)	33	TxD (+)
9	RxD (-)	34	RxD (+)
10	TxD (-)	35	TxD (+)
11	RxD (-)	36	RxD (+)
12	TxD (-)	37	TxD (+)
13	RxD (-)	38	RxD (+)
14	TxD (-)	39	TxD (+)
15	RxD (-)	40	RxD (+)
16	TxD (-)	41	TxD (+)
17	RxD (-)	42	RxD (+)
18	TxD (-)	43	TxD (+)
19	RxD (-)	44	RxD (+)
20	TxD (-)	45	TxD (+)
21	RxD (-)	46	RxD (+)
22	TxD (-)	47	TxD (+)

Table 70: Output signals for the RJ-21 connector (continued)

RJ-21 Pin Numbers	Output Signal	RJ-21 Pin Numbers	Output Signal
23	RxD (-)	48	RxD (+)
24	TxD (-)	49	TxD (+)

Table 71 describes the cable specifications for the RJ-21 connector. Appropriate cables are available from your local supplier.

Table 71: F96Ti cable specifications

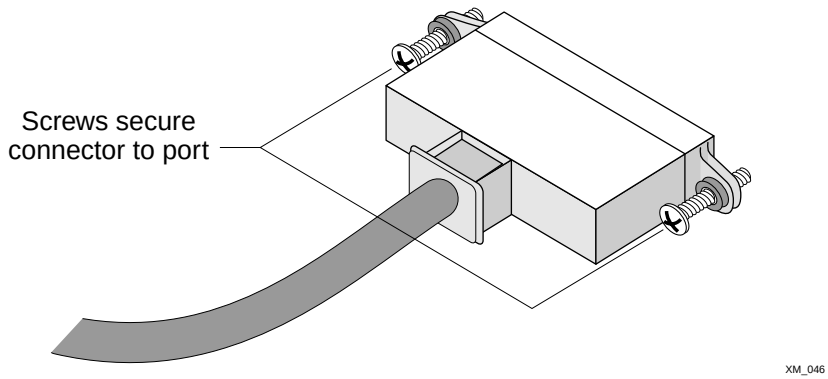
Connectors	Cable	Min Length	Max Length	Max Torque
Lucent 525 Telco 50-pin RJ-21	Shielded trunk cable with 12 CAT5 twisted pairs	1 m	100 m	4 in-lbs

To access the ports, use a 180-degree male RJ-21 connector with a shielded PVC trunk cable and secure to a maximum of 4 in-lbs of torque. You can access the ports in one of the following ways:

- Through a patch panel by terminating the cable and shield with an RJ-21 connector.
- Directly by using a cable that is terminated with 12 RJ-45 connectors.

The RJ-21 connector is shown in Figure 125.

Figure 125: RJ-21 connector



The default configuration of the F96Ti module is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in auto-negotiation mode.

LEDs

The F96Ti module has a module status LED.

For information about the module status LED and its activity on the F96Ti module, see “I/O Module LEDs” on page 271.

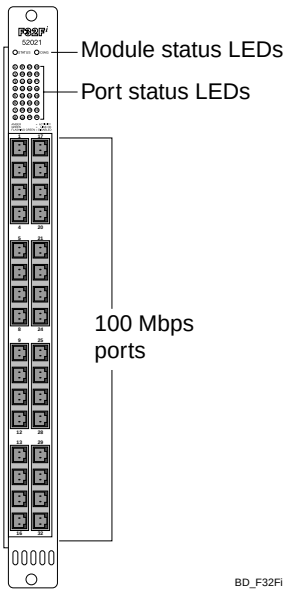
Software Requirements

The F96Ti module requires that you load ExtremeWare version 6.1.8 or later and BootROM 6.5 or later on the switch.

F32Fi Module

Figure 126 shows the F32Fi module.

Figure 126: F32Fi module



All F32Fi ports have 32 100BASE-FX ports and use standard MT-RJ connectors.

The default configuration of the F32Fi modules is as follows. All ports:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (protocol type, VLANid, and so forth).
- Operate in 100 Mbps, full-duplex mode. Half-duplex mode is not supported.

LEDs

The F32Fi module has the following LEDs:

- Module status
- Port status

For information about the LEDs and their activity on the F32Fi module, see “I/O Module LEDs” on page 271.

Software Requirements

The F32Fi module requires that you load ExtremeWare version 6.1.8 or later and BootROM 6.5 or later on the switch.

P3cSi, P3cMi, P12cSi, and P12cMi Modules

Figure 127 shows the P3cSi and P3cMi modules.

Figure 127: P3cSi and P3cMi modules

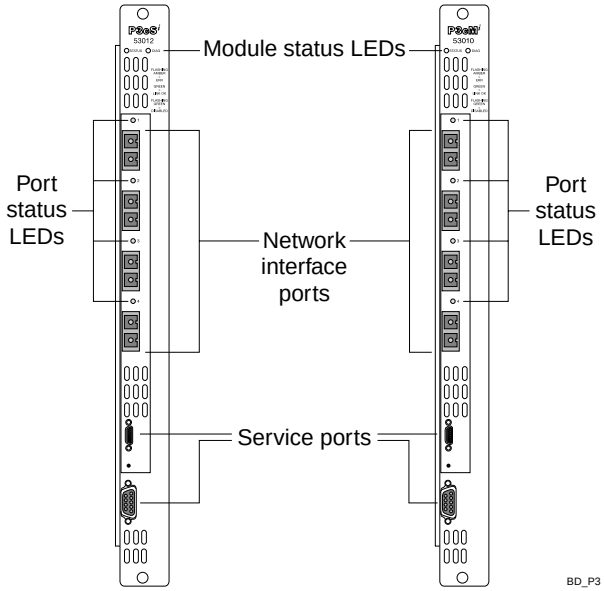
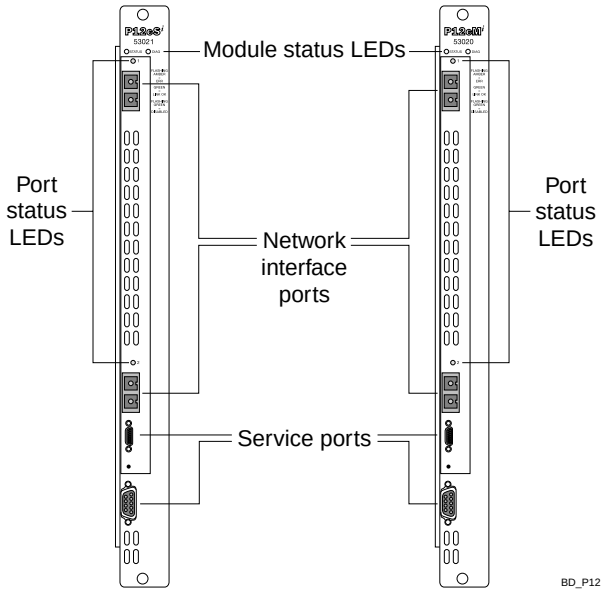


Figure 128 shows the P12cSi and P12cMi modules.

Figure 128: P12cSi and P12cMi modules



The P3cSi and P3cMi, Packet over SONET (PoS), modules each have four OC-3 ports that use duplex SC connectors. The P12cSi and P12cMi PoS modules each have two OC-12 ports that use duplex SC connectors. The P3cSi and the P12cSi modules support single mode fiber-optic cable only, and the P3cMi and the P12cMi modules support multimode fiber-optic cable only. These modules connect the switch to a SONET infrastructure that is used by metropolitan area service providers and operators of server co-location networks.

In the first application, the metropolitan area network service provider can build service network sites in various cities, then use PoS modules in a BlackDiamond 6800 series switch to connect those cities to a carrier's SONET infrastructure.

In the second application, operators of server co-location networks can use PoS modules in BlackDiamond 6800 series switches to create a SONET-based connection between server co-location sites. The result is that their network is simpler to manage, and problems can be isolated and resolved more expediently.

Extreme Networks offers the PoS module in the following configurations:

- P3cMi: four OC-3 multimode, short-reach optical interfaces
- P3cSi: four OC-3 single-mode, intermediate-reach optical interfaces
- P12cMi: two OC-12 multimode, short-reach optical interfaces
- P12cSi: two OC-12 single-mode, intermediate-reach optical interfaces

NOTE

The "c" in the names of the modules indicates that the optical interfaces on these modules operate in concatenated mode, which enables all the bandwidth to be devoted to a single payload stream.

NOTE

PoS modules are a Class 1 laser device.

The default configuration of the P3cSi, P3cMi, P12cSi, and P12cMi modules is as follows:

- Are added to the default VLAN as untagged. For P3c modules, only ports 1 and 3 are added to the default VLAN. Ports 2 and 4 are not added to any VLAN.
- Inherit the properties of the default VLAN (VLANid and so forth).

Table 72 describes the specifications for the P3cSi, P3cMi, P12cSi, and P12cMi optical interfaces.

Table 72: Optical interface specifications for the PoS modules

Parameter	P3cSi	P3cMi	P12cSi	P12cMi
Power budget	13 dB	9 dB	13 dB	10 dB
Operating wavelength	1310 nm	1310 nm	1310 nm	1310 nm
Transmit distance	15 km (9.32 mi)	2 km (1.24 mi)	15 km (9.32 mi)	500 m (0.31 mi)

Physical Description

This section describes the components and the LEDs of the PoS module, as shown in Figure 129.

The PoS module has the following key components:

- Two high-performance network processors
- A General Purpose Processor (GPP) subsystem

The network processors are programmable devices that participate with the Extreme "*i*" chipset to support expanded functionality, features, and flexibility.

The GPP subsystem handles system control and I/O module management functions. The GPP subsystem resides outside of the I/O module data path to optimize performance.

PoS Module LED Indicators. The PoS modules are equipped with two module-level LED indicators (STATUS and DIAG) and one port-level LED indicator for each network interface port on the PoS module as shown in Figure 129.

- STATUS LED—Located near the top end of the PoS module front panel, near the ejector/injector handle. This LED indicator is a bi-color LED (displaying in either green or amber) that signals the operating status of the module as a whole.
- DIAG LED—Located beside the STATUS LED. This LED is a single-color LED (displaying in amber only) that flashes amber when diagnostics are running on the module, and is solid amber if the module fails the diagnostics.
- Port-level LED—Located next to the port number identifying each fiber optic network interface connector on the front panel of the module. The port LED is a bi-color LED (displaying in either green or amber) that signals the operating status of that network interface port.

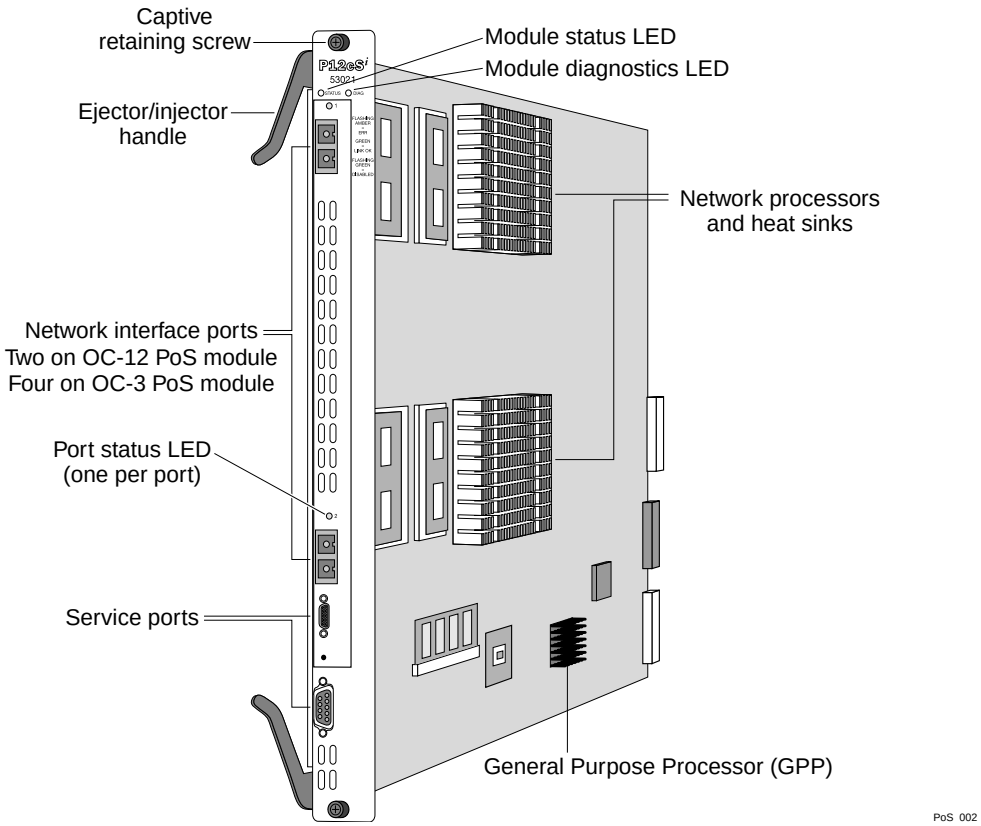
NOTE

During the PoS module boot up, the Status and Diag LEDs may be incorrectly lit to solid green or solid amber. The LEDs reflect their true state after approximately 30 seconds when the module has completed its boot cycle.

For more information on PoS module LED activity, see “I/O Module LEDs” on page 271.

Service Ports. The PoS modules are equipped with two front-panel service ports: one port is a subminiature DB-9 connector; the other is a micro HD-15 connector (see Figure 129). Both ports are reserved for use only by Extreme Networks technical support personnel for diagnostic purposes.

Figure 129: Showing the components and LEDs of the PoS module



Feature Summary

The PoS modules provide the following key networking functions:

- Support for both Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) modes of operation
- Support for the Point-to-Point Protocol (PPP) suite, including:
  - Link Control Protocol (LCP)
  - Link Maintenance option for LCP
  - Link Quality Report (LQR) Protocol
  - Password Authentication Protocol (PAP)
  - Challenge Handshake Authentication Protocol (CHAP)
  - IP Control Protocol (IPCP)
  - Bridging Control Protocol (BCP)
  - MultiProtocol Label Switching Control Protocol (MPLSCP)
  - OSI Network Layer Control Protocol (OSINLCP)
  - Extreme Discovery Protocol Control Protocol (EDPCP)
- Efficient support for IP routing over SONET via IPCP
- Support for Transparent LAN Services (TLS) over SONET via BCP
- Support for MultiProtocol Label Switching over SONET via MPLSCP

- Support for jumbo frames
- Extensive support for Quality of Service (QoS) and Differentiated Services (DiffServ), including:
  - Eight ingress queues and eight egress queues per interface
  - Ingress and egress rate shaping and limiting
  - IEEE 802.1Q VLAN priorities
  - Weighted RED (WRED) congestion avoidance algorithm
  - Assured Forwarding and Expedited Forwarding RFCs
- Support for NetFlow Version 1 per-flow statistics, including:
  - Capacity for two million flow records per PoS module
  - Scalability via distribution to groups of flow-record collector devices
  - Filters enabling statistics to be maintained for selected flows
  - Aggregation option for further reducing the volume of exported data
- Resiliency with fast recovery from SONET link failures via support for Automatic Protection Switching (APS) protocol in multiple configurations, including networks where the working and protection lines are:
  - Terminated in the same SONET module
  - Terminated in different SONET modules residing in the same BlackDiamond 6800 series system
  - Terminated in different SONET modules residing in different BlackDiamond 6800 series systems
- Support for service provider specific features, such as:
  - Flexible remapping of DiffServ codepoints
  - Flexible remapping of IEEE 802.1Q VLAN IDs
  - VLAN tunneling via nested 802.1Q tags
  - Port tunneling of High-Level Data Link Control (HDLC) byte streams

Function Summary

The following sections provide brief descriptions of the key functions provided by the PoS modules. For more information on how to configure the PoS modules, see the *ExtremeWare Software User Guide* and the *ExtremeWare Command Reference Guide*.

SONET and SDH. SONET and SDH are the two terms used to identify a time division multiplexing technology that is optimized for transporting voice traffic across a digital optical network, but that is also capable of providing high-speed capacity for transporting data.

The term SONET is used to identify the technology used within the North American digital network. Its standards are published by Bellcore and the American National Standards Institute (ANSI). The term SDH is used to identify the equivalent standard approved by the International Telecommunication Union (ITU) for use in Europe and elsewhere in the global digital network. Because SDH evolved out of SONET, the two standards are closely joined and have been widely accepted as a dominant choice for implementations requiring high transport capacity and resistance to failure.

PPP. PPP encompasses a suite of protocols designed to provide standard methods for transporting datagrams over point-to-point links. The use of PPP over SONET links is commonly referred to as Packet over SONET, or PoS. The Extreme Networks implementation of PPP for the PoS module provides support for the following protocols in the PPP suite:

- Link Control Protocol (LCP)
- Link Quality Report (LQR) Protocol
- Challenge Handshake Authentication Protocol (CHAP)
- Password Authentication Protocol (PAP)
- IP Control Protocol (IPCP)
- Bridging Control Protocol (BCP)
- Extreme Discovery Protocol Control Protocol (EDPCP)
- Multi Protocol Label Switching Control Protocol (MPLSCP)
- OSI Network Layer Control Protocol (OSINLCP)

MPLS. The PoS module ports provide MPLS support via a PPP link. The MPLS Control Protocol (MPLSCP) allows MPLS labeled packets to be transported across a PPP link.

Jumbo Frames. The PoS module ports provide jumbo frame support that is similar to that provided by Ethernet ports on a BlackDiamond 6800 series switch.

Jumbo frames are Ethernet frames that are larger than 1522 bytes, including four bytes used for the cyclic redundancy check (CRC). Extreme products that use the *"i"* chipset support switching and routing of jumbo frames at wire-speed on all ports.

Jumbo frames are used between endstations that support larger frame sizes for more efficient transfers of bulk data. Both endstations involved in the transfer must be capable of supporting jumbo frames.

QoS and Differentiated Services. The PoS modules support eight ingress queues and eight egress queues per port. The scheduling parameters for these queues (minimum bandwidth, maximum bandwidth, priority level, etc.) are controlled by QoS profiles that you can customize for individual ingress or egress queues on a specific PoS port.

You can assign frames to queues based on IEEE 802.1p priorities, MPLS EXP values, Differentiated Services Code Points (DSCPs), or by configuring a QoS profile for the port or VLAN. You can tailor the DSCP-to-queue mapping for ingress or egress directions on a per-port basis. Most of the existing ingress classification functions, along with the DiffServ replacement functions, are also supported for PoS ports.

The supported DiffServ functions maximize user flexibility while providing all of the features needed to support the standard per-hop behaviors (PHBs), including:

- Default
- Class Selector
- Assured Forwarding
- Expedited Forwarding

The PoS modules also provide flexible support for the well-known Weighted RED (WRED) congestion avoidance algorithm.

NetFlow Statistics. Each PoS port can maintain and export statistics for the flows that traverse the associated SONET link.

Per-flow statistics are useful for many management purposes, including:

- Accounting and billing

- Network capacity planning and trend analysis
- Network monitoring
- Workload characterization
- User profiling
- Data warehousing and mining

Each PoS module can maintain two million flow records. Per-flow statistics are reported in the NetFlow, Version 1 format, which groups flow records together into UDP datagrams for export to a flow-collector device.

The PoS module also provides a NetFlow distribution feature to provide a growth path to more scalable and robust collection architectures. This feature allows a single PoS port to distribute statistics across multiple groups of flow-collector devices in a load-balanced manner. The function also includes a health-check feature that significantly improves the reliability of the collection architecture. The health-checker ensures that only responsive flow-collector devices are included in the effective export distribution lists.

To further enhance scalability, the PoS module also offers filters and filter-based aggregation options that allow you to configure a PoS port to maintain statistics selectively for only those flows matching specified filters. The aggregation options can further reduce the volume of exported data by enabling a single set of statistics to be maintained for all the flows that match an aggregation filter.

Automatic Protection Switching. Automatic Protection Switching, or APS, is a physical-layer resiliency feature specified in the SONET standards. Multiplex Section Protection, or MSP, is the APS equivalent in the SDH standard, which is also supported by the PoS module. Throughout this guide, the terms *APS* and *Automatic Protection Switching* are used to refer to the protection switching features of both standards.

Of the various protection switching modes specified in the SONET/SDH standards, the BlackDiamond 6800 series switches use the linear 1+1 architecture to protect tributary SONET lines. In the linear 1+1 architecture, there is one protection line for each working line. If the working line fails, traffic is automatically switched to the protection line. You can also control whether traffic switched to the protection line is automatically switched back to the working line when it is restored to service.

The Extreme Networks implementation supports network configurations where:

- Working and protection lines are terminated in the same PoS module.
- Working and protection lines are terminated in different PoS modules residing in the same BlackDiamond 6800 series switch.
- Working and protection lines are terminated in different PoS modules residing in different BlackDiamond 6800 series switches.

Service Provider Features

The PoS modules provide the following features for service provider environments:

- DSCP mapping
- VLAN ID (VID) tag mapping
- VLAN ID (VID) tag nesting
- Port tunneling

DSCP Mapping. You can use the `diffserv dscp-mapping` command to configure a mapped relationship between an input DSCP and an associated output DSCP. Each PoS port supports three DSCP mapping tables: one of the tables is used in the ingress direction; two are used for egress flows (onto the SONET link). The two egress tables are for the congested and noncongested states, as determined by the RED algorithm. If RED is not enabled on the PoS port, the egress congested-state mapping table is not used.

In the ingress direction, the input DSCP of a packet received from the SONET link is replaced by an output DSCP before the packet is forwarded. In the egress direction, the operation is similar, except that the DSCP mapping occurs before the packet is transmitted onto the SONET link.

One potential use of the DSCP mapping capability is to reconcile varying DiffServ policies at the boundary between autonomous systems, such as at the boundary between two ISPs. The availability of different tables for the congested and noncongested states is useful in marking operations that increase the probability of packets being dropped during times of congestion, as discussed in the DiffServ Assured Forwarding RFC (RFC 2597).

VLAN ID (VID) Tag Mapping. An analogous feature has been added for managing 802.1Q tags. The `dot1q tagmapping` command provides support for VLAN ID (VID) mapping tables. Each PoS port supports two VID tables: one table is used in the ingress direction; the other is used in the egress direction. Each of the tables enables an input VID to be mapped to an output VID. This feature is useful in reconciling policy differences at the boundary between the customer and the service provider.

VLAN ID (VID) Tag Nesting. Another related enhancement provides support for nested 802.1Q tags by allowing a *tag push* or *tag pop* attribute to be associated with a VID. The *push* attribute indicates that a new tag is to be added to the frame, while the *pop* attribute indicates that the top-level tag is to be removed from the frame. This capability is augmented by an option that allows the 802.1p priority of the frame to be either preserved or set to a user-configurable value when a new tag is pushed. These functions make it possible for service providers to tunnel customer-specific VLANs across a common SONET backbone in a very simple manner.

Port Tunneling. The PoS module also supports port tunneling. Port tunneling can be used to encapsulate and transport the raw High-Level Data Link Control (HDLC) encapsulated byte stream from one PoS port to another PoS port across an MPLS network. This allows service providers to tunnel different types of SONET HDLC streams across a non-SONET backbone like Ethernet.

Software Requirements

The PoS modules require that you run ExtremeWare 7.0 or later on both the MSM64i module and the PoS module, BootROM 7.8 for the MSM64i module, and BootROM 1.18 for the PoS module.

For more information about software requirements and PoS module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide*.

Hardware Requirements

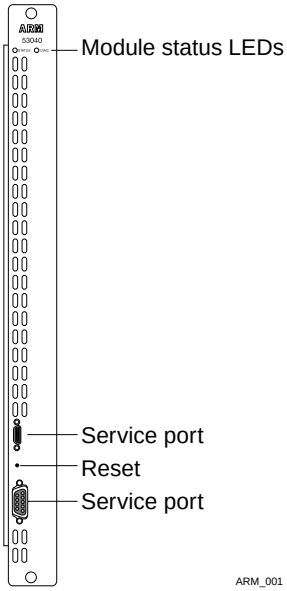
The PoS modules are compatible with *"i"*series MSM modules only. For the most current list of I/O modules supported for use with the PoS modules, consult your release notes.

PoS modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

ARM

Figure 130 shows the Accounting and Routing Module (ARM).

Figure 130: Accounting and Routing Module (ARM)



The ARM is a self-contained module for the BlackDiamond 6800 series chassis-based system. Unlike most other BlackDiamond modules, there are no external interfaces on the ARM. Instead, the ARM provides advanced IP services for the other I/O modules installed in the chassis. The ARM contains a powerful set of packet processing resources and four full-duplex Gigabit Ethernet internal ports that connect to the BlackDiamond backplane switch fabric. The ARM operates in a one-armed fashion:

- Receiving frames from the switch fabric.
- Processing the frames.
- Transmitting the frames back into the switch fabric which then sends them to the appropriate I/O module.

A maximum of four ARM modules can be placed in a BlackDiamond 6800 series switch at any one time.

Physical Description

This section describes the components and the LEDs of the ARM module, as shown in Figure 131.

The ARM module has the following key components:

- Two high-performance network processors
- A GPP subsystem

The network processors are high-performance, programmable devices that enhance the Extreme "*i*" chipset to support expanded functionality, features, and flexibility.

The GPP subsystem handles system control and ARM management functions. The GPP subsystem resides outside the packet forwarding data path to optimize routing and billing performance.

ARM LED Indicators. The ARM is equipped with two module-level LED indicators (STATUS and DIAG) (see Figure 131).

- STATUS LED—Located near the top end of the ARM front panel, near the ejector/injector handle. This LED indicator is a bi-color LED (displaying in either green or amber) that signals the operating status of the module.
- DIAG LED—Located beside the STATUS LED. The LED is a bi-color LED (displaying in either green or amber) that signals whether diagnostics are being run on the module.

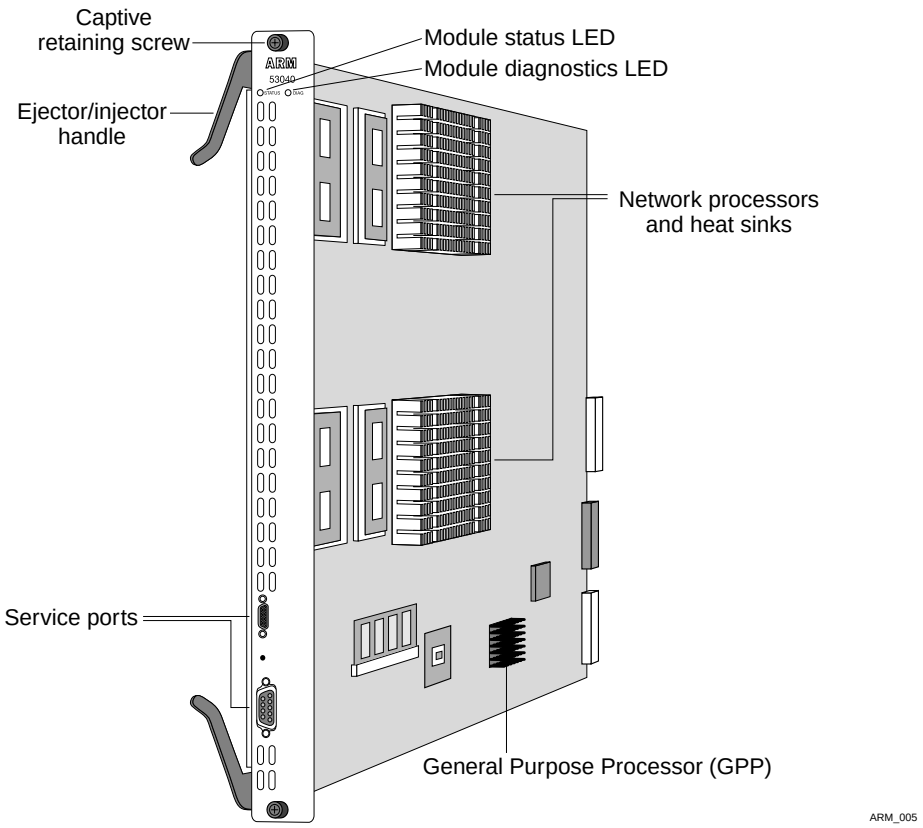
NOTE

During the ARM module boot up, the Status and Diag LEDs may be incorrectly lit to solid green or solid amber. The LEDs reflect their true state after approximately 30 seconds when the module has completed its boot cycle.

For more information on ARM module LED activity, see "I/O Module LEDs" on page 271.

Service Ports. The ARM module is equipped with two front-panel service ports: one port is a DB-9 connector; the other is a micro HD-15 connector (see Figure 131). Both ports are reserved for use only by Extreme Networks technical support personnel for diagnostic purposes.

Figure 131: Showing the components and LEDs of the ARM module



Summary of Features

The ARM includes the following features:

- IP unicast forwarding (with selective longest prefix match)
- Destination-sensitive accounting

IP Unicast Forwarding. IP unicast packets are forwarded in the ARM module using the longest prefix match algorithm. Counts of packets and bytes are maintained based on the routes used to forward packets.

All IP unicast forwarding is performed on the ARM to facilitate implementation of accounting. When longest prefix match or accounting is enabled, the ARM, rather than the switch fabric hardware, performs layer-3 IP unicast forwarding. Layer-2 switching and layer-3 IP multicast forwarding are unaffected.

ExtremeWare distributes its IP unicast routing table, ARP table, and interface IP addresses to each ARM so that every ARM contains the same IP routing database.

Each ARM has sufficient capacity to support 239 K IP longest prefix match lookup route entries. Each route entry also supports up to four equal-cost paths, providing a maximum routing database capacity of 958 K routes. IP forwarding is configurable per VLAN.

Each ARM IP routing database provides an aggregate IP forwarding throughput of up to 4 Gbps. The total forwarding throughput for a single BlackDiamond chassis can be scaled up to 16 Gbps by adding up to four ARM modules. ARMs interface to the BlackDiamond switch fabric via four 1 Gbps internal links.

See the *ExtremeWare Software User Guide* for more information about configuring longest prefix matching on the ARM.

Destination-Sensitive Accounting. Counts of IP packets and bytes are maintained based on the IP routes used to forward packets. Destination-sensitive accounting gives you the flexibility to bill your customers at predetermined and different rates. The rates are based on the customers' IP unicast packet destinations.

Destination-sensitive accounting categorizes IP unicast packets according to two parameters:

- The ID of the VLAN from which the packet was received
- The accounting bin number associated with the route used to forward the packet

For each category, 64-bit counts of both the number of packets and number of bytes forwarded, excluding those locally delivered to the MSM CPU, are collected. Eight accounting bin numbers, with values from 0-7, are available for each of the possible 4096 VLAN IDs. This yields a maximum of 32768 sets of accounting statistics.

You use accounting statistics to bill your customers. For a given set of statistics, the source VLAN ID identifies the customer and the accounting bin number corresponds to a billing rate.

Use the ExtremeWare `route-map` function to configure policies that assign accounting bin numbers to IP routes. Bin zero is the default bin. Any route that does not have an explicit bin assignment via the `route-map` function defaults to bin zero.

You retrieve accounting statistics via the CLI and SNMP.

See the *ExtremeWare Software User Guide* for more information about configuring destination-sensitive accounting on the ARM.

Software Requirements

The ARM module requires that you run ExtremeWare 7.0 or later on both the MSM64i module and the ARM module, BootROM 7.8 for the MSM64i module, and BootROM 1.18 for the ARM module.

For more information about software requirements and ARM module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide.*

Hardware Requirements

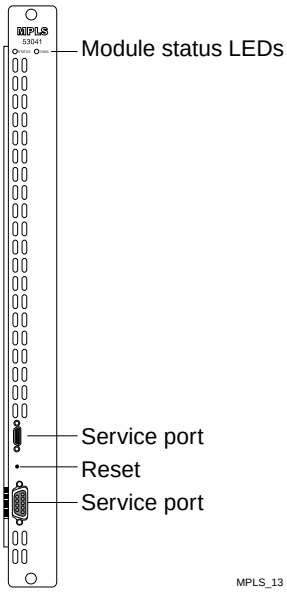
The ARM module is compatible with "*i*" series MSM modules only. For the most current list of I/O modules supported for use with the ARM module, consult your release notes.

ARM modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

MPLS Module

Figure 132 shows the MultiProtocol Label Switching (MPLS) module.

Figure 132: MultiProtocol Label Switching (MPLS) module



The MultiProtocol Label Switching (MPLS) module contains a powerful set of network processors that are specifically programmed to implement the MPLS function. The module has no external ports, but it contains four full-duplex Gigabit Ethernet internal ports that connect to the BlackDiamond backplane switch fabric. Each internal processor provides media-speed packet processing for two internal full-duplex Gigabit Ethernet ports. The MPLS module operates in a one-armed fashion:

- Receiving frames from the switch fabric.
- Processing the frames.
- Transmitting the frames back into the switch fabric which then sends them to the appropriate I/O module.

A maximum of four MPLS modules can be placed in a BlackDiamond 6800 series switch at any one time.

Physical Description

This section describes the components and the LEDs of the MPLS module, as shown in Figure 133.

The MPLS module has the following key components:

- Two high-performance network processors
- A GPP subsystem

The network processors are high-performance, programmable devices that enhance the Extreme "*i*" chipset to support expanded functionality, features, and flexibility.

The GPP subsystem handles system control and MPLS management functions. The GPP subsystem resides outside the packet forwarding data path to optimize routing and billing performance.

MPLS LED Indicators. The MPLS module is equipped with two module-level LED indicators (STATUS and DIAG) (see Figure 133).

- STATUS LED—Located near the top end of the front panel, near the ejector/injector handle. This LED indicator is a bi-color LED (displaying in either green or amber) that signals the operating status of the module.
- DIAG LED—Located beside the STATUS LED. The LED is a bi-color LED (displaying in either green or amber) that signals whether diagnostics are being run on the module.

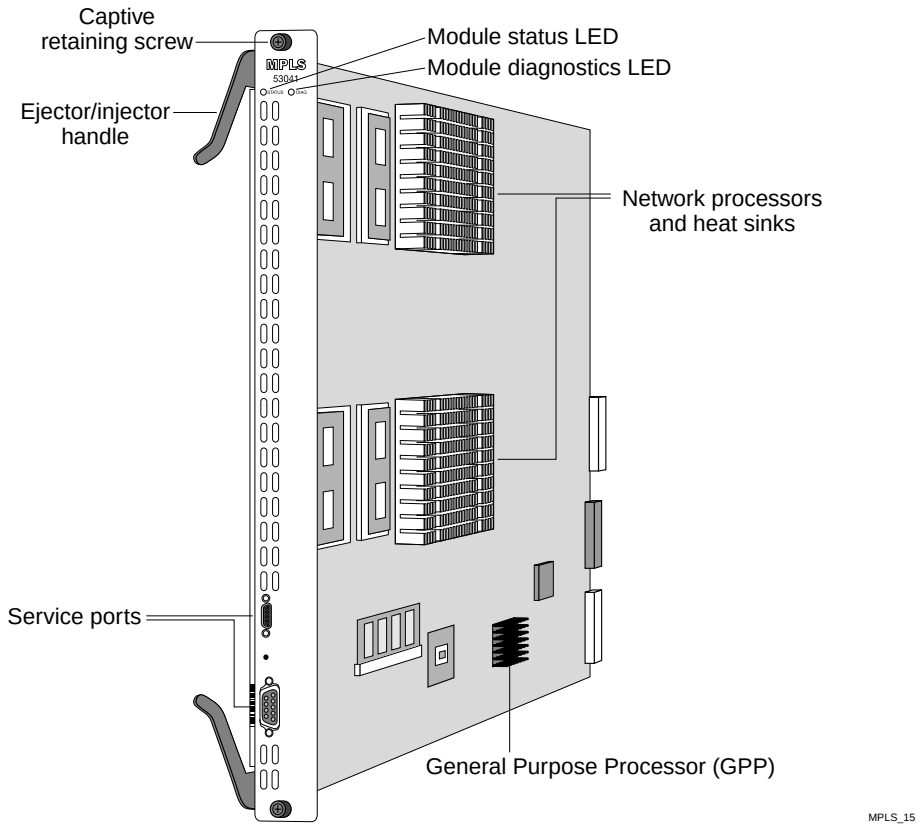
NOTE

During the MPLS module boot up, the Status and Diag LEDs may be incorrectly lit to solid green or solid amber. The LEDs reflect their true state after approximately 30 seconds when the module has completed its boot cycle.

For more information on MPLS module LED activity, see "I/O Module LEDs" on page 271.

Service Ports. The MPLS module is equipped with two front-panel service ports: one port is a subminiature DB-9 connector; the other is a micro HD-15 connector (see Figure 133). The ports are reserved for use only by Extreme Networks technical support personnel for diagnostic purposes.

Figure 133: Showing the components and LEDs of the MPLS module



Summary of Features

The MPLS module includes the following features:

- MPLS
- IP unicast forwarding (with selective longest prefix match)
- Destination-sensitive accounting

MPLS. MultiProtocol Label Switching (MPLS) is a forwarding algorithm that uses short, fixed-length labels to make next-hop forwarding decisions for each packet in a stream.

MPLS is a technology that allows routers to make protocol-independent forwarding decisions based on fixed-length labels. The use of MPLS labels enables routers to avoid the processing overhead of delving deeply into each packet and performing complex route lookup operations based upon destination IP addresses.

In an MPLS environment, incoming packets are initially assigned “labels” by a Label Edge Router (LER). The labels allow the packets to be more efficiently handled by MPLS-capable routers at each point along the forwarding path.

An MPLS label essentially consists of a short fixed-length value carried within each packet header and that identifies a Forwarding Equivalence Class (FEC). The FEC tells the router how to handle the packet. An FEC is defined to be a group of packets that are forwarded in the same manner. Examples of FECs include an IP prefix, a host address, or a VLAN ID. The label concept in MPLS is analogous to other connection identifiers, such as an ATM VPI/VCI or a Frame Relay DLCI.

By mapping to a specific FEC, the MPLS label efficiently provides the router with all of the local link information needed for immediate forwarding to the next hop. MPLS creates a Label Switched Path (LSP) along which each Label Switch Router (LSR) can make forwarding decisions based solely upon the content of the labels. At each hop, the LSR simply strips off the existing label and applies a new one that tells the next LSR how to forward the packet.

MPLS Layer-2 VPNs. As networks grow and become more pervasive, the need to separate the physical network infrastructure from the logical network or VLAN organization has become increasingly important. By logically separating the network topology from the service provided by the physical network, services are more easily managed, reliability through increased redundancy is improved, and you gain more efficient use of the physical network infrastructure.

By mapping a VLAN to a specific set of MPLS tunnels, you can create virtual private networks (VPNs). Within a VPN, all traffic is opaquely transported across the service provider network. Each VPN can be managed and provisioned independently.

VPNs may have two or more customer points of presence (PoP). All PoPs are interconnected using point-to-point tunnels. If there are two PoPs in the VPN, the VPN is considered to be point-to-point. If there are more than two PoPs in the VPN, the VPN is considered to be multipoint. Multipoint VPNs can be fully-meshed or hub-and-spoke.

Layer-2 VPNs are constructed from a set of interconnected point-to-point MPLS tunnels. Tunnel endpoint nodes operate as virtual VPN switches, bridging traffic between tunnels and the local egress VLAN. MAC caching is integrated into the MPLS module. Source MAC addresses within each VPN are associated with the tunnel from which the packet is received. Up to 256K MAC addresses can be cached. Within a VPN, once a MAC address has been learned, unicast traffic destined to the cached MAC address is transmitted over a single tunnel. Integrated VPN MAC caching enhancement increases network performance and improves VPN scalability.

IP Unicast Forwarding. IP unicast packets are forwarded in the MPLS module using the longest prefix match algorithm. IP unicast forwarding is required to switch packets at ingress or upon egressing an MPLS network domain.

All IP unicast forwarding is performed on the MPLS module to facilitate implementation of MPLS and accounting. When MPLS, longest prefix match, or accounting functions are enabled, the MPLS module, rather than the switch fabric hardware, performs layer-3 IP unicast forwarding. Layer-2 switching and Layer-3 IP multicast forwarding are unaffected. See the *ExtremeWare Software User Guide* for more information about configuring longest prefix match on the MPLS module.

ExtremeWare distributes its IP unicast routing table, ARP table, MPLS incoming label mappings (ILMs), FEC-to-NHFLE database, and interface IP addresses to each MPLS module so that every MPLS module contains the same IP routing database.

Each MPLS module has sufficient capacity to support 256K IP longest prefix match lookup route entries. Each route entry also supports up to four equal-cost paths. IP forwarding is configurable per VLAN.

Each MPLS module IP routing database provides an aggregate IP forwarding throughput of up to 4 Gbps. The total forwarding throughput for a single BlackDiamond chassis can be scaled up to 16 Gbps by adding up to four MPLS modules. MPLS modules interface to the BlackDiamond switch fabric via four 1 Gbps internal links. IP unicast traffic is internally forwarded from the BlackDiamond I/O modules using one of three backplane load-sharing policies: port-based, address-based, or round-robin. See the *ExtremeWare Software User Guide* for more information.

Destination-Sensitive Accounting. Counts of IP packets and bytes are maintained based on the IP routes used to forward packets. Destination-sensitive accounting gives you the flexibility to bill your

customers at predetermined and different rates. The rates are based on the customers' IP unicast packet destinations.

Destination-sensitive accounting allows you to bill your customers at different rates depending upon the destination of the IP unicast packets they send.

Destination-sensitive accounting categorizes IP unicast packets according to two parameters:

- The ID of the VLAN from which the packet was received
- The accounting bin number associated with the route used to forward the packet

For each category, 64-bit counts of both the number of packets and number of bytes forwarded, excluding those locally delivered to the MSM CPU, are collected. Eight accounting bin numbers, with values from 0-7, are available for each of the possible 4096 VLAN IDs. This yields a maximum of 32768 sets of accounting statistics.

You use accounting statistics to bill your customers. For a given set of statistics, the source VLAN ID identifies the customer and the accounting bin number corresponds to a billing rate.

Use the ExtremeWare `route-map` function to configure policies that assign accounting bin numbers to IP routes. Bin 0 is the default bin. Any route that does not have an explicit bin assignment via the `route-map` function defaults to bin 0.

You retrieve accounting statistics via the CLI and SNMP.

See the *ExtremeWare Software User Guide* for more information about configuring destination-sensitive accounting on the MPLS module.

Software Requirements

The MPLS module requires that you run ExtremeWare 7.0 or later on both the MSM64i module and the MPLS module, BootROM 7.8 for the MSM64i module, and BootROM 1.18 for the MPLS module.

For more information about software requirements and MPLS module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide.*

Hardware Requirements

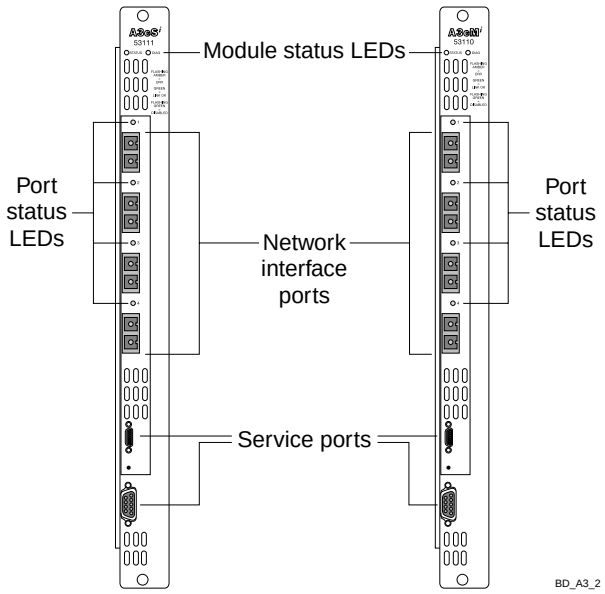
The MPLS module is compatible with *"i"* series MSM modules only. For the most current list of I/O modules supported for use with the MPLS module, consult your release notes.

MPLS modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

A3cSi and A3cMi Modules

Figure 134 shows the A3cSi and A3cMi modules.

Figure 134: A3cSi and A3cMi modules



The A3cSi and A3cMi, Asynchronous Transfer Mode (ATM), modules have four OC-3 ports using duplex SC connectors. The A3cSi supports single mode fiber-optic cable only, and the A3cMi support multimode fiber-optic cable only. These modules interconnect metropolitan area networks across an ATM infrastructure, interconnect server co-location network sites directly using ATM links, and provide connectivity between a legacy Enterprise ATM network and an Ethernet backbone.

In the first application, the metropolitan area network service provider can build service network sites in various cities, then use ATM modules in a BlackDiamond 6800 series switch to connect those cities to a carrier's ATM infrastructure.

In the second application, operators of server co-location networks can use ATM modules in BlackDiamond 6800 series switches to create an ATM-based connection between server co-location sites. The result is that their network is simpler to manage, and problems can be isolated and resolved more expediently.

In the third application, a service provider can provide Ethernet-based services by using ATM modules in a BlackDiamond 6800 series switch to connect their Enterprise ATM network to an Ethernet backbone.

Extreme Networks offers the ATM module in the following configurations:

- A3cSi—four OC-3 single-mode, intermediate-reach optical interfaces
- A3cMi—four OC-3 multimode, short-reach optical interfaces

NOTE

The "c" in the names of the modules indicates that the optical interfaces on these modules operate in concatenated mode, which enables all the bandwidth to be devoted to a single payload stream.

NOTE

The ATM module is a Class 1 laser device.

The default configuration of the A3cSi and A3cMi modules is as follows. Ports 1 and 3:

- Are added to the default VLAN as untagged.
- Inherit the properties of the default VLAN (VLANid and so forth).

Table 73 describes the specifications for the A3cSi optical interface.

Table 73: Optical interface specifications for the ATM modules

Parameter	A3cSi	A3cMi
Power budget	13 dB	9 dB
Operating wavelength	1310 nm	1310 nm
Transmit distance	15 km (9.32 mi)	2 km (1.24 mi)

Physical Description

This section describes the components and the LEDs of the ATM module, as shown in Figure 129.

The ATM module has the following key components:

- Two high-performance network processors
- A GPP subsystem

The network processors are programmable devices that participate with the Extreme "*i*" chipset to support expanded functionality, features, and flexibility.

The GPP subsystem handles system control and I/O module management functions. The GPP subsystem resides outside of the I/O module data path to optimize performance.

ATM Module LED Indicators. The ATM module is equipped with two module-level LED indicators (STATUS and DIAG) and one port-level LED indicator for each network interface port on the ATM module (see Figure 135).

- STATUS LED—Located near the top end of the ATM module front panel, near the ejector/injector lever. This LED indicator is a bi-color LED (displaying in either green or amber) that signals the operating status of the module as a whole.
- DIAG LED—Located beside the STATUS LED. This LED is a single-color LED (displaying in amber only) that flashes amber when diagnostics are running on the module, and is solid amber if the module fails the diagnostics.
- Port-level LED—Located next to the port number identifying each fiber optic network interface connector on the front panel of the module. The port LED is a bi-color LED (displaying in either green or amber) that signals the operating status of that network interface port.

NOTE

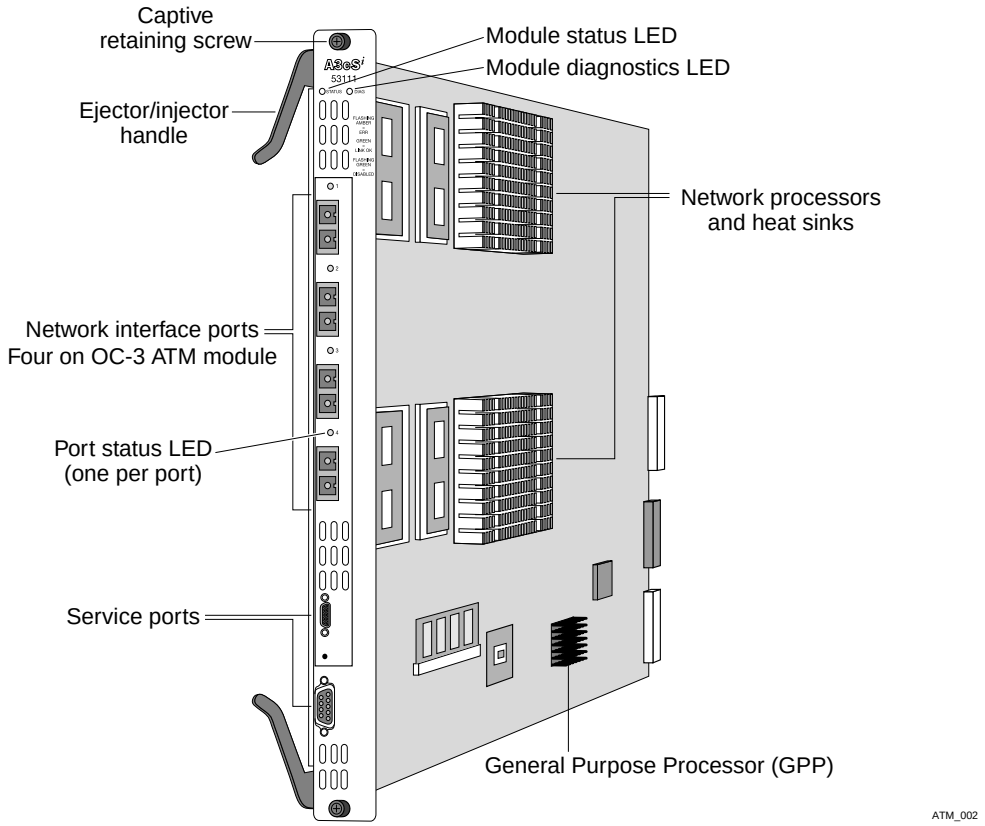
During the ATM module boot up, the Status and Diag LEDs may be incorrectly lit to solid green or solid amber. The LEDs reflect their true state after approximately 30 seconds when the module has completed its boot cycle.

For more information on ATM module LED activity, see "I/O Module LEDs" on page 271.

Service Ports

The ATM module is equipped with two front-panel service ports: one port is a DB-9 connector; the other is a micro HD-15 connector (see Figure 135). Both ports are reserved for use only by Extreme Networks technical support personnel for diagnostic purposes.

Figure 135: Showing the components and LEDs of the ATM module



Feature Summary

The ATM module supports the following key networking functions:

- SONET and SDH modes of operation
- IP routing via the Logical Link Control (LLC) Encapsulation for Routed Protocols compatible with RFC 2684/RFC 1483
- TLS over ATM via the LLC Encapsulation Bridged Protocols compatible with RFC 2684/RFC 1483

- Permanent Virtual Circuits (PVCs) may be associated with one or more VLANs
- Routed and bridged encapsulations on the same PVC
- Jumbo frames
- QoS and DiffServ features, including support for:
  - Eight ingress queues and eight egress queues per interface
  - Ingress and egress rate shaping and limiting
  - IEEE 802.1p VLAN priorities
  - WRED congestion avoidance algorithm
  - Assured Forwarding and Expedited Forwarding RFCs
- Service provider specific features, such as:
  - Flexible remapping of DiffServ codepoints
  - Flexible remapping of IEEE 802.1Q VLAN IDs
  - VLAN tunneling via nested 802.1Q tags

Function Summary

The following sections provide brief descriptions of the key functions provided by the ATM module. For more information on how to configure the ATM modules, see the *ExtremeWare Software User Guide* and the *ExtremeWare Command Reference Guide.*

ATM. ATM is a connection-oriented packet transmission technique that is widely used in existing telecommunications networks to transport voice, video, and data. ATM uses fixed size data packets called “cells” which are 53-bytes long and have a header that includes a connection identifier. The connection identifier makes it possible to support more than one point-to-point connection on a single physical ATM connection. The switches in an ATM network use the connection identifier in each cell to forward the cell to the next hop.

SONET and SDH. SONET and SDH are the two terms used to identify a time division multiplexing technology that is optimized for transporting voice traffic across a digital optical network, but that is also capable of providing high-speed capacity for transporting data.

The term SONET is used to identify the technology used within the North American digital network. Its standards are published by Bellcore and the American National Standards Institute (ANSI). The term SDH is used to identify the equivalent standard approved by the International Telecommunication Union (ITU) for use in Europe and elsewhere in the global digital network. Because SDH evolved out of SONET, the two standards are closely related and have been widely accepted as a dominant choice for implementations requiring high transport capacity and resistance to failure. The term SONET is used through out this guide. In instances where there are differences between SONET and SDH, the differences are explicitly called out.

Jumbo Frames. The ATM module ports provide jumbo frame support that is similar to that provided by Ethernet ports on a BlackDiamond 6800 series switch.

Jumbo frames are Ethernet frames that are larger than 1522 bytes, including four bytes used for the cyclic redundancy check (CRC). Extreme products that use the “*i*” chipset support switching and routing of jumbo frames at wire-speed on all ports.

Jumbo frames are used between endstations that support larger frame sizes for more efficient transfers of bulk data. Both endstations involved in the transfer must be capable of supporting jumbo frames.

QoS and Differentiated Services. The ATM module supports eight ingress queues and eight egress queues per port. The scheduling parameters for these queues (minimum bandwidth, maximum bandwidth, priority level, etc.) are controlled by QoS profiles that you can customize for individual ingress or egress queues on a specific ATM port.

You can assign frames to queues based on IEEE 802.1p priorities, Differentiated Services Code Points (DSCPs), or by configuring a QoS profile for the port or VLAN. You can tailor the DSCP-to-queue mapping on a per-port basis. Most of the existing ingress classification functions, along with the DiffServ replacement functions, are also supported for ATM ports.

The supported DiffServ functions maximize user flexibility while providing all of the features needed to support the standard per-hop behaviors (PHBs), including:

- Default
- Class Selector
- Assured Forwarding
- Expedited Forwarding

The ATM module also provides flexible support for the well-known Weighted RED (WRED) congestion avoidance algorithm.

Service Provider Features

The ATM module provides the following features for service provider environments:

- DSCP mapping
- VLAN ID (VID) tag mapping
- VLAN ID (VID) tag nesting
- VLAN to PVC mapping

DSCP Mapping. You can use the `diffserv dscp-mapping` command to configure a mapped relationship between an input DSCP and an associated output DSCP. Each ATM port supports three DSCP mapping tables: one of the tables is used in the ingress direction; two are used for egress flows (onto the ATM link). The two egress tables are for the congested and noncongested states, as determined by the RED algorithm. If RED is not enabled on the ATM port, the egress congested-state mapping table is not used.

In the ingress direction, the input DSCP of a packet received from the ATM link is replaced by an output DSCP before the packet is forwarded. In the egress direction, the operation is similar, except that the DSCP mapping occurs before the packet is transmitted onto the ATM link.

One potential use of the DSCP mapping capability is to reconcile varying DiffServ policies at the boundary between autonomous systems, such as at the boundary between two ISPs. The availability of different tables for the congested and noncongested states is useful in marking operations that increase the probability of packets being dropped during times of congestion, as discussed in the DiffServ Assured Forwarding RFC (RFC 2597).

VLAN ID (VID) Tag Mapping. An analogous feature has been added for the managing of 802.1Q tags. The `dot1q tagmapping` command provides support for VLAN ID (VID) mapping tables. Each ATM port supports two VID tables: one table is used in the ingress direction; the other is used in the egress direction. Each of the tables enables an input VID to be mapped to an output VID. This feature is useful in reconciling policy differences at the boundary between the customer and the service provider.

VLAN ID (VID) Tag Nesting. Another related enhancement provides support for nested 802.1Q tags by allowing a *tag push* or *tag pop* attribute to be associated with a VID. The *push* attribute indicates that a new tag is to be added to the frame, while the *pop* attribute indicates that the top-level tag is to be removed from the frame. This capability is augmented by an option that allows the 802.1p priority of the frame to be either preserved or set to a user-configurable value when a new tag is pushed. These functions make it possible for service providers to tunnel customer-specific VLANs across a common ATM backbone in a very simple manner.

VLAN to PVC Mapping. VLAN to PVC mapping can be used by service providers to isolate and provision a customer's traffic using different VLANs and PVCs for each customer. Thus, a service provider can securely transport a customer's Ethernet traffic across an ATM backbone or vice-versa.

Software Requirements

The ATM module requires that you run ExtremeWare 7.0 or later on both the MSM64i module and the ATM module, BootROM 7.8 for the MSM64i module, and BootROM 1.18 for the ATM module.

For more information about software requirements and ATM module configuration, see the *ExtremeWare Software User Guide* and *the ExtremeWare Command Reference Guide.*

Hardware Requirements

The ATM module is compatible with *"i"* series MSM modules only. For the most current list of I/O modules supported for use with the ATM module, consult your release notes.

ATM modules installed in a BlackDiamond chassis require at least one BlackDiamond Ethernet I/O module also installed in the chassis in order to operate correctly.

I/O Module LEDs

This section describes the LED activity on the BlackDiamond I/O modules:

- Table 74 describes the LED activity on the Ethernet I/O modules
- Table 75 describes the LED activity on the PoS and ATM modules
- Table 76 describes the LED activity on the ARM and MPLS modules

Table 74: BlackDiamond Ethernet I/O module LEDs

LED	Color	Indicates
Status	Green blinking	Normal operation
	Amber blinking	Configuration error, code version error, diagnostic failure, or other severe module error
	Off	No power
DIAG	Off	Normal operation
	Amber blinking	Diagnostics in progress
	Amber	Diagnostic failure
Port *x*	Green	Link up
	Green blinking	Link down
	Amber blinking	Packet activity
	Off	Link down

Table 75: BlackDiamond PoS and ATM module LEDs

LED	Color	Indicates
Status	Green blinking	Normal operation
	Amber blinking	Configuration error, code version error, diagnostic failure, or other severe module error
	Off	No power
DIAG	Off	Normal operation
	Amber blinking	Diagnostics in progress
	Amber	Diagnostic failure
Port *x*	Green	Link up[1]
	Green blinking	Link disabled
	Amber blinking, returning to green	Activity on link
	Amber blinking	Link down; SONET link problem
	Off	No received signal

1 If you have a PoS module, the link is up, but the PPP/VLAN interface might not be up. To determine whether PPP is up, use the `show ppp` command to display PPP status information.

Table 76: BlackDiamond ARM and MPLS module LEDs

LED	Color	Indicates
Status	Flashing green	Normal operation
	Flashing amber	Configuration error, code version error, diagnostic failure, or other severe module error
	Off	No power
DIAG	Green	Normal operation
	Flashing amber	Diagnostics in progress
	Amber	Diagnostic failure

Installing I/O Modules

You can insert I/O modules at any time, without causing disruption of network services. Complete the action of inserting a BlackDiamond I/O module in a reasonable time frame. Be sure to insert the module completely to avoid partial insertion or connection of backplane connectors.

You need the following tools and equipment to install an I/O module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- I/O module
- Appropriate type of cable for the I/O module you plan to install

To install an I/O module:

1 Select a slot for the module:

- Slots numbered 1 through 16 in the BlackDiamond 6816 chassis
- Slots numbered 1 through 8 in the BlackDiamond 6808 chassis
- Slots numbered 1 through 4 in the BlackDiamond 6804 chassis

CAUTION

You can install I/O modules only in slots 1 through 16 in the BlackDiamond 6816, slots 1 through 8 in the BlackDiamond 6808, or slots 1 through 4 on the BlackDiamond 6804. I/O modules do not fit in slots A, B, C, or D. Forceful insertion can damage the I/O module.

2 Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.

3 Remove the blank faceplate from the slot to make room for the module, if applicable.

NOTE

Any unoccupied module slot in the chassis should have a blank faceplate installed to ensure satisfactory protection from EMI and to guarantee adequate airflow through the chassis.

4 Grasp the module by its front panel with one hand, and place your other hand under the edge of the metal panel to support the weight of the module. Check the connectors for dust and packing materials.

CAUTION

To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

5 For the BlackDiamond 6816 and the BlackDiamond 6804, ensure that the module is horizontal with the module name to the left, the PCB on top, and that the ejector/injector levers are extended.

For the BlackDiamond 6808, ensure that the module is vertical with the module name at the top, the PCB to the right, and that the ejector/injector levers are extended.

a Slide the module into the appropriate slot of the chassis (slots 1 through 16 in the BlackDiamond 6816, slots 1 through 8 in the BlackDiamond 6808, or slots 1 through 4 in the BlackDiamond 6804), until it makes contact with the backplane.

NOTE

Use the metal panel, not the PCB, to guide the I/O module

As the module begins to seat in the chassis, the ejector/injector levers begin to close.

b To close the ejector/injector levers, use both hands simultaneously to push the levers toward the center of the module.

c To secure the module, tighten the two captive screws using a #1 Phillips screwdriver.

NOTE

Tighten the screws of this module before *inserting additional modules. Otherwise, you might unseat modules that you have not secured.*

6 Store the module packaging for future use.

7 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To install additional I/O modules, repeat steps 1 through 6.

Verifying the I/O Module Installation

After you install an I/O module, verify that it is working correctly. Check the LEDs on the front panel of the I/O module and use the command-line interface (CLI) `show slot <slot number>` command to display slot-specific information about the newly installed module.

LED Indicators

When the I/O module and its ports (if applicable) are configured and operating normally, the front-panel LED indicators should appear as follows:

- STATUS LED—green blinking
- DIAG LED—off
- Port status LED (per port):

  The ARM and MPLS modules do not have external network interfaces (ports); therefore, there are no port status LEDs on those modules.

  — Green

  — Amber blinking (all except ATM and PoS modules)

  — Amber blinking, returning to green (ATM and PoS modules only)

For more information about I/O module LED activity, see “I/O Module LEDs” on page 271.

Displaying Slot Status Information

Assuming the I/O module has no problems, the command `show slot <slot>` (where *<slot>* is the number of the slot where you installed the module) displays information about the module including: general information about the module (name, serial number, part number), the state of the module (power down, operational, mismatch between the slot configuration and the module in the slot), and the status of the ports on the module.

If you have an ARM, PoS, ATM, or MPLS module, the command `show slot <slot>` also displays that ExtremeWare has detected the module and set it to the OPERATIONAL state. As the module progresses through its initialization, the GPP subsystem state changes to OPERATIONAL, and then each of the network processors state changes to OPERATIONAL.

For more information about slot status information, see the *ExtremeWare Software User Guide* and the *ExtremeWare Command Reference Guide*.

Removing I/O Modules

All BlackDiamond I/O modules are hot-swappable. You do not need to power off the system to remove a module. Complete the action of removing a BlackDiamond I/O module in a reasonable time frame. Be sure to remove the module completely to avoid partial insertion or connection of backplane connectors.

NOTE

If you remove a BlackDiamond I/O module during traffic flow to the module, several error messages might be written to the log immediately following. These messages should cease to occur after 10 seconds. Under this circumstance, the error messages can be safely ignored. The error messages might contain one or more of the following:

```
04/13/1999 17:18.46 <DBUG:KERN> killPacket: HW pqmWaitRx failed
04/13/1999 17:18.46 <DBUG:KERN> pqmWaitKill failed. Card 1 is removed
```

You need the following tools and equipment to remove an I/O module:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement I/O module or blank faceplate if you are not replacing the I/O module

To remove an I/O module:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. Use a #1 Phillips screwdriver to unscrew the two captive screws.
3. Simultaneously rotate the ejector/injector levers outward to disengage the module from the backplane.
   a. Grasp the module front panel with one hand, and place your other hand under the metal panel to support the weight of the module.

   CAUTION

   To prevent ESD damage, handle the module by the metal panel edges only. Never touch the components on the PCB or pins on any of the connectors.

   b. Slide the module out of the chassis and place it immediately into an antistatic sack to protect it from ESD damage and to prevent dust from collecting on the module's connectors.
4. If you are not going to install a replacement I/O module, cover the slot with a blank faceplate. Otherwise, follow the I/O module installation procedure on page 272.
5. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

To remove additional I/O modules, repeat steps 1 through 4.

17 BlackDiamond 6800 Series Switch Fan Tray

This chapter describes:

- BlackDiamond 6816 Fan Trays on page 277
- BlackDiamond 6808 Fan Tray on page 278
- BlackDiamond 6804 Fan Tray on page 279
- Removing a BlackDiamond 6800 Series Fan Tray on page 280
- Installing a BlackDiamond 6800 Series Fan Tray on page 282

NOTE

Read the information in this chapter thoroughly before you attempt to install or remove any BlackDiamond fan tray.

BlackDiamond 6816 Fan Trays

The BlackDiamond 6816 fan trays (no. 53013):

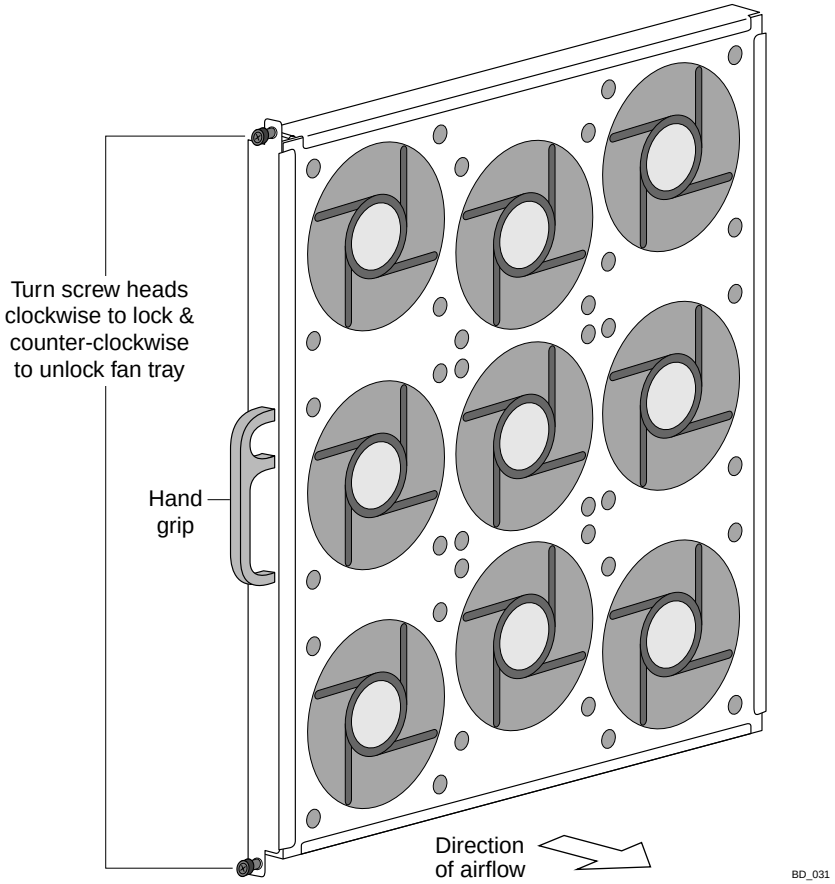
- Contain nine individual fans
- Are preinstalled at the factory
- Are accessed from the front of the chassis
- Are hot-swappable which means you can remove and replace a fan tray without powering down the system

CAUTION

Do not cover or obstruct the fan ventilation holes at the side of the unit. Doing so can result in overheating and possible damage to the BlackDiamond 6816 switch. Thermal sensors will shut down the BlackDiamond 6816 switch if the internal temperature exceeds 60 degrees Celsius.

ExtremeWare monitors the fan trays in the BlackDiamond 6816 switch for failure and overheat conditions. All fan failures and over temperature events cause the switch to send alerts to the network management station or to the switch log. See the *ExtremeWare Software User Guide* for more information on switch monitoring.

Figure 136: BlackDiamond 6816 fan tray



BlackDiamond 6808 Fan Tray

The BlackDiamond 6808 fan tray (no. 50013):

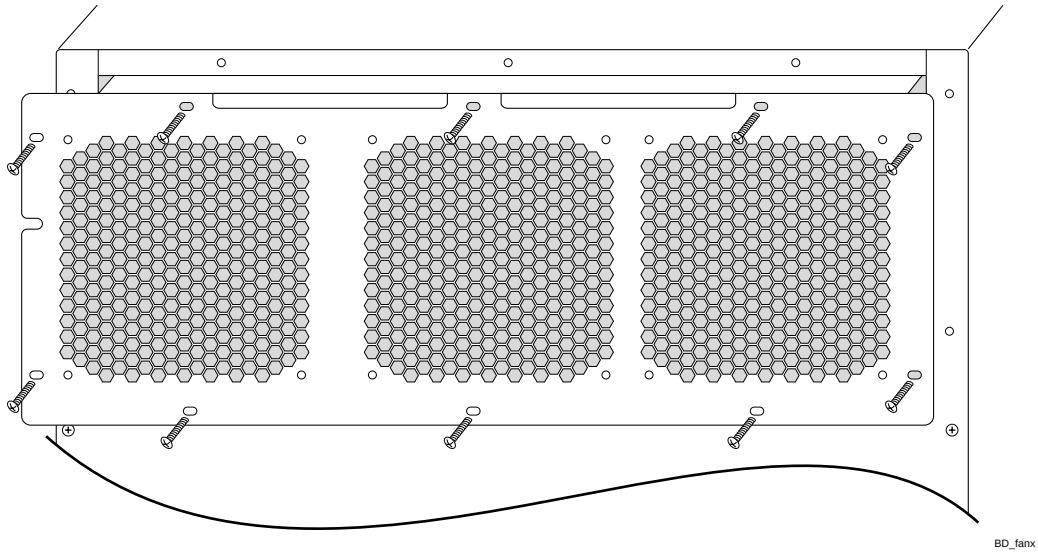
- Contains three individual fans
- Is preinstalled at the factory
- Is accessed from the rear of the chassis
- Is hot-swappable which means you can remove and replace the fan tray without powering down the system

CAUTION

Do not cover or obstruct the fan ventilation holes at the rear of the unit. Doing so can result in overheating and possible damage to the BlackDiamond 6808 switch. Thermal sensors will shut down the BlackDiamond 6808 switch if the internal temperature exceeds 60 degrees Celsius.

ExtremeWare monitors the fan trays in the BlackDiamond 6808 switch for failure and overheat conditions. All fan failures and over temperature events cause the switch to send alerts to the network management station or to the switch log. See the *ExtremeWare Software User Guide* for more information on switch monitoring.

Figure 137: BlackDiamond 6808 fan tray



BlackDiamond 6804 Fan Tray

The BlackDiamond 6804 fan tray (no. 50053):

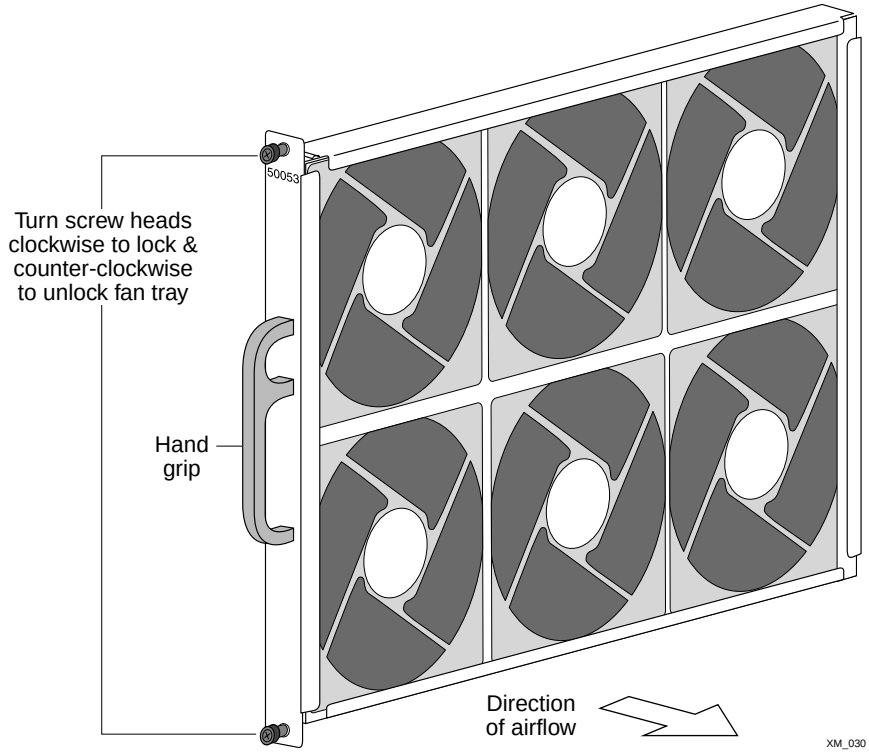
- Contains six individual fans
- Is preinstalled at the factory
- Is accessed from the front of the chassis
- Is hot-swappable which means you can remove and replace the fan tray without powering down the system

CAUTION

Do not cover or obstruct the fan ventilation holes at the side of the unit. Doing so can result in overheating and possible damage to the BlackDiamond 6804 switch. Thermal sensors will shut down the BlackDiamond 6804 switch if the internal temperature exceeds 60 degrees Celsius.

ExtremeWare monitors the fan trays in the BlackDiamond 6804 switch for failure and overheat conditions. All fan failures and over temperature events cause the switch to send alerts to the network management station or to the switch log. See the *ExtremeWare Software User Guide* for more information on switch monitoring.

Figure 138: BlackDiamond 6804 fan tray



Removing a BlackDiamond 6800 Series Fan Tray

BlackDiamond 6800 series fan trays are hot-swappable. You do not need to turn off power to a BlackDiamond 6800 series switch to remove a fan tray.

You need the following tools and equipment to remove a fan tray:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver

CAUTION

Only trained service personnel should perform service to BlackDiamond fan trays. Before installing or removing any components, or carrying out any maintenance procedures, see Appendix A.

To remove a fan tray from the BlackDiamond 6800 series switch:

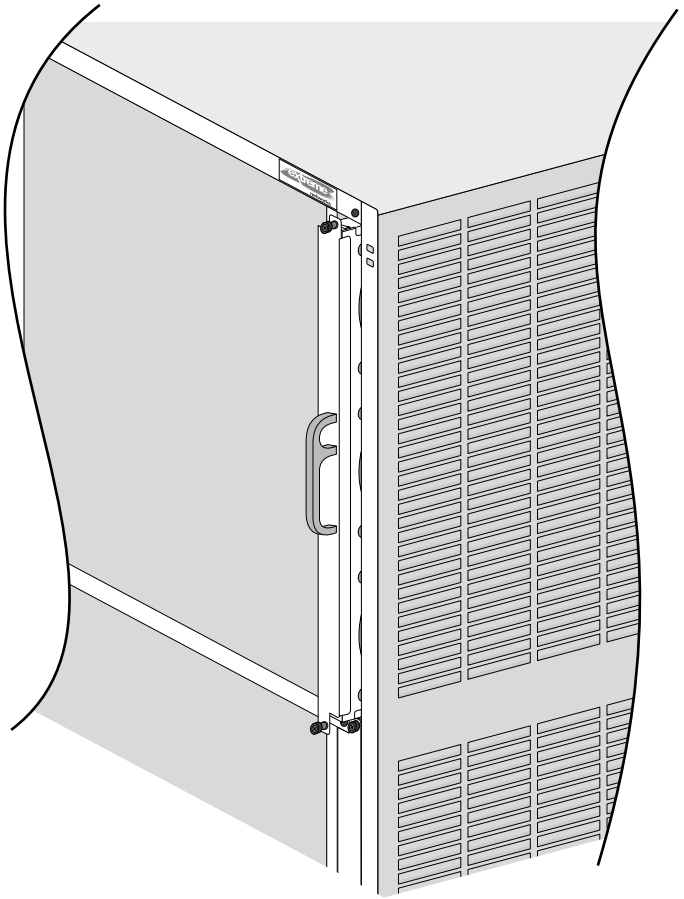
1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. For the BlackDiamond 6816 switch or the BlackDiamond 6804 switch, use a #1 Phillips screwdriver to unscrew the two screws that secure the fan tray on the front of the chassis.

   For the BlackDiamond 6808 switch, use a #1 Phillips screwdriver to unscrew the ten screws that secure the fan tray to the rear of the chassis. Put the screws aside in a safe place.

3 For the BlackDiamond 6816 switch or the BlackDiamond 6804 switch, use the handle on the front of the fan tray to pull it straight out of the chassis approximately ½ inch (12.7 mm), as shown in Figure 139. This action disconnects the power to the fan tray.

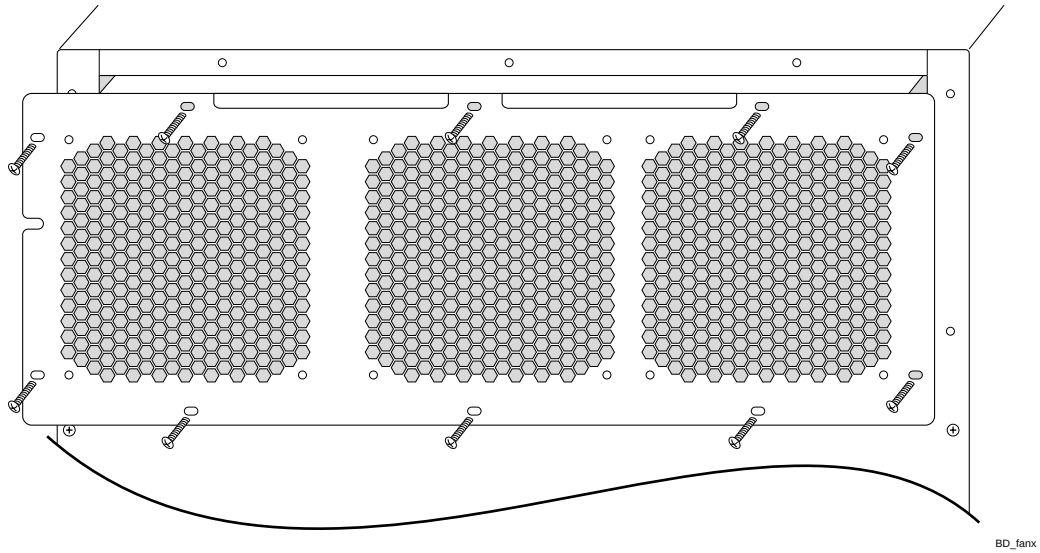
For the BlackDiamond 6808 switch, grasp the edges of the two handles on the front of the fan tray to pull it straight out of the chassis approximately ½ inch (12.7 mm), as shown in Figure 140. This action disconnects power to the fan tray.

Figure 139: An example of removing the BlackDiamond 6816 or the BlackDiamond 6804 fan tray



BD_030

Figure 140: An example of removing the BlackDiamond 6808 fan tray



4 Allow the fan blades to stop spinning before removing the fan tray completely.

WARNING!

Keep your hands your away from rotating fan blades.

5 Repeat this procedure for additional fan trays, if applicable.

6 Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.

Installing a BlackDiamond 6800 Series Fan Tray

BlackDiamond 6800 series fan trays are hot-swappable. You do not need to turn off power to a BlackDiamond 6800 series switch to install a fan tray.

You need the following tools and equipment to install a fan tray:

- ESD-preventive wrist strap
- # 1 Phillips screwdriver
- Replacement fan tray

CAUTION

Only trained service personnel should perform service to BlackDiamond fan trays. Before installing or removing any components, or carrying out any maintenance procedures, see Appendix A.

To install a fan tray into the BlackDiamond 6800 series switch:

1. Attach the ESD strap that is provided to your wrist and connect the metal end to the ground receptacle that is located on the top-left corner of the switch front panel.
2. Check the connectors for dust and packing materials.
3. Ensure that the fan tray is right side up.
4. For the BlackDiamond 6816 switch and the BlackDiamond 6804 switch, support the fan tray with one hand under the fan tray and use the other hand to guide the fan tray into the slot. Gently begin to insert the new fan tray into the slot.

   For the BlackDiamond 6808 switch, use both hands to hold the fan tray handles and use the two pins located on each side of the fan tray to guide the fan tray into the bay. Gently begin to insert the new fan tray into the bay.

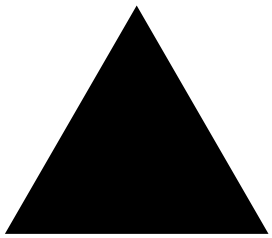
   NOTE

   If the chassis is powered on, the fan blades will begin turning as soon as the tray makes contact with the backplane.

5. Secure the fan tray.

   For the BlackDiamond 6816 switch and the BlackDiamond 6804 switch, turn the screws clockwise until they become tight.

   For the BlackDiamond 6808 switch, use the screws that you saved earlier and turn the screws clockwise until they become tight.
6. Leave the ESD strap permanently connected to the chassis so that it is always available when you need to handle ESD-sensitive components.



Part 6
Switch Operation

18 Initial Switch and Management Access

This chapter describes:

- Connecting Equipment to the Console Port on page 287
- Logging In for the First Time on page 288

Connecting Equipment to the Console Port

Connection to the console port is used for direct local management. The console port settings are:

- **Baud rate**—9600
- **Data bits**—8
- **Stop bit**—1
- **Parity**—None
- **Flow control**—XON / XOFF

The terminal or PC with terminal-emulation software that you connect to any Summit, Alpine, or BlackDiamond switch must be configured with these settings.This procedure is described in the documentation supplied with the terminal.

Appropriate cables are available from your local supplier, or you can make your own. To ensure the electromagnetic compatibility of the unit, only shielded serial cables should be used. Table 77 describes the pinouts for a DB-9 male console connector.

Table 77: Pinouts for the console connector

Function	Pin Number	Direction
DCD (data carrier detect)	1	In
RXD (receive data)	2	In
TXD (transmit data)	3	Out
DTR (data terminal ready)	4	Out
GND (ground)	5	-
DSR (data set ready)	6	In
RTS (request to send)	7	Out

Table 77: Pinouts for the console connector (continued)

Function	Pin Number	Direction
CTS (clear to send	8	In

Figure 141 shows the pinouts for a 9-pin to 25-pin (RS-232) null-modem cable.

Figure 141: Null-modem cable pinouts

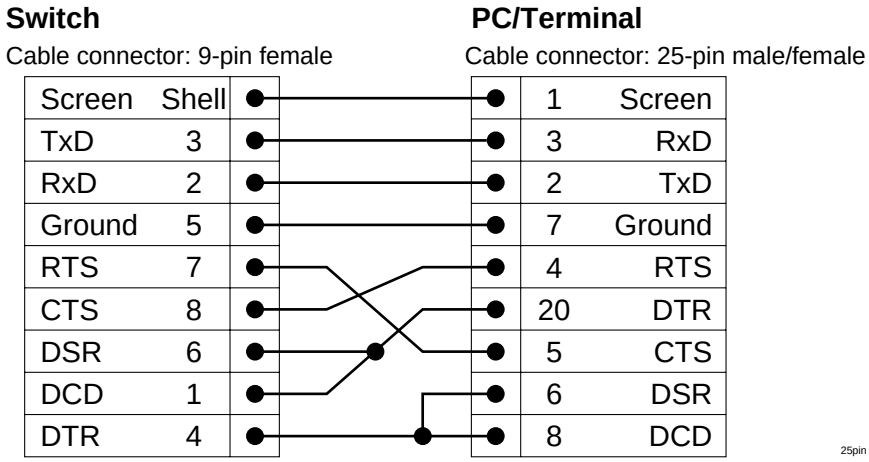
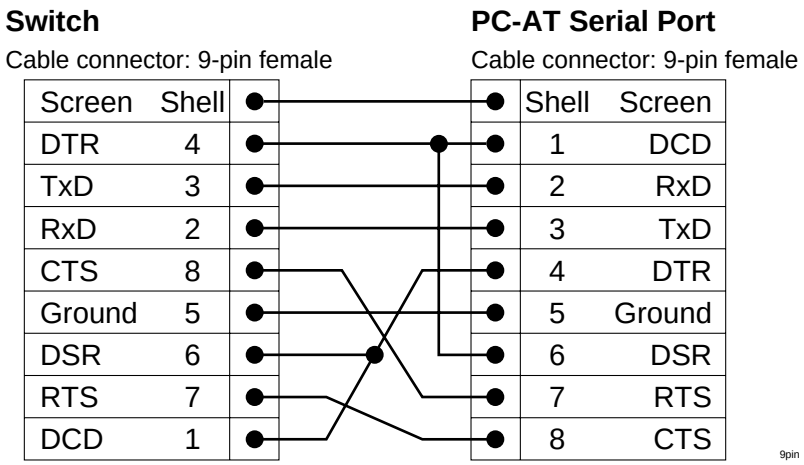


Figure 142 shows the pinouts for a 9-pin to 9-pin (PC-AT) null-modem serial cable.

Figure 142: PC-AT serial null-modem cable pinouts



Logging In for the First Time

After your switch has completed all POSTs, it is operational. When the switch is operational, you can log in and configure an IP address for the default VLAN (named *default*).

To manually configure the IP settings:

1 Connect a terminal or PC with terminal-emulation software to:

- The console port for Summit switches
- The SMMi for the Alpine 3808 and Alpine 3804 switches
- The console port for the Alpine 3802 switch
- The MSM64i for BlackDiamond switches

2 At your terminal, press [Return] one or more times until you see the login prompt.

3 At the login prompt, enter the default user name *admin* to log on with administrator privileges. For example:

```
login: admin
```

Administrator capabilities allow you to access all switch functions.

NOTE

For more information about logging in to the switch and configuring switch management access, see the ExtremeWare Software User Guide*.*

4 At the password prompt, press [Return].

This is because the default user name, *admin*, has no password assigned to it. When you have successfully logged on to the system, the command-line prompt displays the system name (for example, `BlackDiamond6800>` in its prompt.

NOTE

For more information about how to make a specific system name, see the ExtremeWare Software User Guide*.*

5 Assign an IP address and subnetwork mask for VLAN *default* by typing:

config vlan default ipaddress 123.45.67.8 255.255.255.0

Your changes take effect immediately.

6 Save your configuration changes so that they will be in effect after the next system reboot, by typing:

save

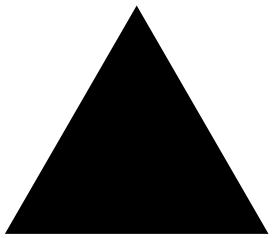
The configuration is saved to the configuration database of the SMMi modules in the Alpine switch and both MSM64i modules in the BlackDiamond switch.

NOTE

For more information about saving configuration changes, see the ExtremeWare Software User Guide*.*

7 When you are finished with these tasks, log out of the switch by typing:

logout



Part 7
Appendixes

A Safety Information

Important Safety Information

WARNING!

Read the following safety information thoroughly before installing your Extreme Networks switch. Failure to follow this safety information can lead to personal injury or damage to the equipment.

Installation, maintenance, and removal of a switch, chassis, or its components must be done by qualified service personnel only.

Qualified service personnel have had appropriate technical training and experience that is necessary to be aware of the hazards to which they are exposed when performing a task and of measures to minimize the danger to themselves or other people.

You should consider the following before unpacking your equipment:

- Install the equipment in a secured, enclosed, and restricted-access area, ensuring that only qualified service personnel have access to the equipment.
- Install the equipment only in a temperature- and humidity-controlled indoor area that is free of airborne materials that can conduct electricity. Too much humidity can cause a fire. Too little humidity can produce electrical shock and fire.
- When you handle the equipment on modular switches, put on the ESD wrist strap to reduce the risk of electronic damage to the equipment. Leave the ESD strap permanently attached to the chassis so that it is always available when you need to handle ESD-sensitive components.

Power

The Summit series switch has either one or two power inputs depending on the switch model. The Alpine 3800 series switch has either one or two power inputs depending on the switch model. The BlackDiamond 6816 has either four 220 VAC power inputs, eight 110 VAC power inputs, or eight -48 VDC power inputs. The BlackDiamond 6808 has either two 220 VAC power inputs, four 110 VAC power inputs, or four -48 VDC power inputs.

- Disconnect power before removing the back panel of an Alpine switch or BlackDiamond switch.
- The unit must be grounded. Do not connect the power supply unit to an AC outlet without a ground connection.

- The unit must be connected to a grounded outlet to comply with European safety standards.
- The socket outlet must be near the unit and easily accessible. You can only remove power from the unit by disconnecting the power cable from the outlet.
- This unit operates under Safety Extra Low Voltage (SELV) conditions according to the IEC 950 standard. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.
- The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN60320/IEC320 appliance inlet.
- *France and Peru only*
  This unit cannot be powered from IT† supplies. If your supplies are of IT type, this unit must be powered by 230 V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labeled Neutral and connected directly to ground.

Power Cable

Use an AC power cable appropriate for your country. Check your local electrical codes and regulatory agencies for power cable requirements. The countries listed below have the following additional requirements:

- USA and Canada
  - The cable set must be UL-listed and CSA-certified.
  - The minimum specification for the flexible cable is No. 18 AWG (1.5 mm^2), Type SVT or SJT, 3-conductor.
  - The cable set must have a rated current capacity of at least the amount rated for each specific product.
  - The AC attachment plug must be an Earth-grounding type with a NEMA 5-15P (10 A, 125 V) configuration.
- Denmark
  - The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
- Switzerland
  - The supply plug must comply with SEV/ASE 1011.
- Argentina
  - The supply plug must comply with Argentinian standards.

NOTE

When using dual power supplies, make sure that each AC power supply attaches to an independent power source.

Fuse

This information only pertains to the Summit series of switches, with the exception of the Summit7i.

The unit automatically adjusts to the supply voltage, and it is suitable for both 110 VAC and 200-240 VAC operation.

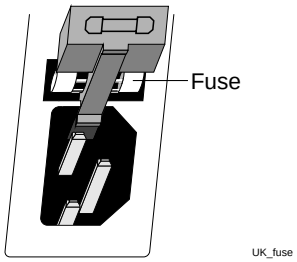
To change the fuse in a Summit series switch:

1 To change the fuse, disconnect power from the unit before opening the fuse holder cover.

2 Release the fuse holder by gently levering a small screwdriver under the fuse holder catch.

3 Replace the fuse. Use only fuses of the same manufacturer, rating, and type as the original.

4 Close the fuse holder.



To comply with European safety standards, a spare fuse must not be fitted to the appliance inlet. Use only fuses of the same manufacturer, make, and type.

Connections

Fiber Optic ports - Optical Safety. To protect your eyes, never look at the transmit LED/laser through a magnifying device while it is powered on. Never look directly at a fiber port on the switch or at the ends of fiber cable when they are powered on.

This is a Class 1 laser device.

WARNING!

Use fiber optic ports only for data communications applications that require optical fiber. Use only with the appropriate connector. When not in use, replace dust cover. Using this module in ways other than those described in this manual can result in intense heat that can cause fire, property damage, or personal injury.

Lithium Battery

The battery in the bq4830/DS1644 device is encapsulated and not user-replaceable. The battery is located on the SMMi for the Alpine switch, and the MSM motherboard for the BlackDiamond switch.

If service personnel disregard the instructions and attempt to replace the bq4830/DS1644, replace the lithium battery with the same or equivalent type, as recommended by the manufacturer.

WARNING!

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

- Disposal requirements vary by country and by state.
- Lithium batteries are not listed by the Environmental Protection Agency (EPA) as a hazardous waste. Therefore, they can typically be disposed of as normal waste.

- If you are disposing of large quantities, contact a local waste-management service.
- No hazardous compounds are used within the battery module.
- The weight of the lithium contained in each coin cell is approximately 0.035 grams.
- Two types of batteries are used interchangeably:
  - CR chemistry uses manganese dioxide as the cathode material.
  - BR chemistry uses poly-carbonmonofluoride as the cathode material.

B Switch Technical Specifications

This appendix describes the technical specifications of the Extreme Networks family of switches:

- Summit “i” series switch specifications on page 297
- Summit non-“i” series switch specifications on page 299
- Summit24e2 switch specifications on page 300
- Summit24e3 switch specifications on page 301
- SummitPx1 application switch specifications on page 302
- Alpine 3800 series switch specifications on page 302
- BlackDiamond 6800 series switch specifications on page 304
- Common switch specifications on page 306

Table 78: Summit “i” series switch specifications

Physical Dimensions	
	Summit1i
	Height: 3.5 inches (8.9 cm) Width: 17.25 inches (43.8 cm) Depth: 19.0 inches (48.3 cm) Weight: 22 lbs (10 kg)
	Summit5i
	Height: 3.5 inches (8.9 cm) Width: 17.25 inches (43.8 cm) Depth: 19.0 inches (48.3 cm) Weight (single power supply): 21.7 lbs (9.8 kg) Weight (dual power supply): 27.4 lbs (12.4 kg)
	Summit7i
	Height: 7.0 inches (17.8 cm) Width: 17.25 inches (43.8 cm) Depth: 19.0 inches (48.3 cm) Weight (single power supply): 45 lbs (20.4 kg) Weight (dual power supply): 55 lbs (24.9 kg)
	Summit48i
	Height: 3.5 inches (8.9 cm) Width: 17.25 inches (43.8 cm) Depth: 19.0 inches (48.3 cm) Weight: 24 lbs (10.8 kg)

	Summit48si
	Height: 1.75 inches (4.45 cm) Width: 17.3 inches (43.9 cm) Depth, including PSU handle: 18.25 inches (46.41 cm) Weight: 14 lbs (6.35 kg)
Safety	
Certifications and Standards	UL 1950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 #950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4, A11 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Interference/ Compatibility (EMI/EMC)	
Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	EN60068 to Extreme IEC68 schedule
Heat Dissipation	**Summit1i**
	SX—105 W maximum (358 BTU/hr maximum)
	TX—187 W maximum (638 BTU/hr maximum)
	Summit5i
	SX—200 W maximum (683 BTU/hr maximum)
	TX—345 W maximum (1177 BTU/hr maximum)
	LX—200 W maximum (683 BTU/hr maximum)
	Summit7i
	SX—372 W maximum (1270 BTU/hr maximum)
	TX—698 W maximum (2382 BTU/hr maximum)
	Summit48i
	140 W maximum (477 BTU/hr maximum)
	Summit48si
	185 W maximum (631 BTU/hr maximum)
Power Supplies	
Summit1i	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	85 VAC to 250 VAC
Current Rating	100-120/200-240 VAC 3/1.5 A
Summit5i	
AC Line Frequency	50 Hz to 60 Hz

Input Voltage Options	100 VAC to 240 VAC
Current Rating	100-120/200-240 VAC 4/2 A
Summit7i	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	90 VAC to 264 VAC
Current Rating	100-120/200-240 VAC 10/5 A
Summit48i	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	85 VAC to 250 VAC
Current Rating	100-120/200-240 VAC 3/1.5 A
Summit48si	
AC Line Frequency	50 Hz to 60 Hz, auto ranging
Input Voltage Options	100 VAC to 240 VAC
Current Rating	100-120/200-240 VAC 3/1.5 A
Switch Power-Off	
Temperature power-off	**Summit1i, Summit5i, Summit48i**
	Power-One supplies: 75° to 80° C (167° to 176° F)
	Summit 7i
	Martek supplies: 75° C (167° F)

Table 79: Summit non-“i” series switch specifications

Physical Dimensions	
	Summit4, Summit4FX, Summit24, Summit48
	Height: 3.5 inches (8.9 cm) Width: 17.32 inches (44 cm) Depth: 17.42 inches (44.25 cm) Weight: 22 lbs (10 kg)
Safety	
Certifications and Standards	UL 1950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 #950 EN60950:1992 A1-A3 plus deviations IEC950CB, IEC 60950:1991 A1-A4 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	

Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	EN60068 to Extreme IEC68 schedule
Heat Dissipation	140 W maximum (341.2 BTU/hr maximum)
Power Supply	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	90 VAC to 264 VAC, auto-ranging
Current Rating	100-120/200-240 VAC 3.0/1.5 A
Switch Power-Off	
Temperature power-off	**Summit 24/48** Digital supplies, not Rev. C1: Not drifting: 65° to 70° C (149° to 158° F) Drifting: 50° C (122° F) Digital supplies, Rev. C1: 70° to 75° C (158° to 167° F) Power-One supplies, Rev. OL and earlier: 60° to 65° C (140° to 149° F) Power-One supplies, Rev. OM and later: 75° C (167° F)

Table 80: Summit24e2 switch specifications

Physical Dimensions	
	Height: 1.7 inches (4.3 cm) Width: 17.25 inches (43.8 cm) Depth: 8.32 inches (21.1 cm) Weight: 7 lbs (3.2 kg)
Safety	
Certifications and Standards	UL 1950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 #950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4, A11 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	

Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	EN60068 to Extreme IEC68 schedule
Heat Dissipation	40 W maximum (136 BTU/hr maximum)
Power Supply	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	100 VAC to 240 VAC, auto-ranging

Table 81: Summit24e3 switch specifications

Physical Dimensions	
	Height: 1.7 inches (4.3 cm) Width: 17.25 inches (43.8 cm) Depth: 8.32 inches (21.1 cm) Weight: 7 lbs (3.2 kg)
Safety	
Certifications and Standards	UL 1950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 #950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia)
Environmental	EN60068 to Extreme IEC68 schedule
Heat Dissipation	74 W maximum (252 BTU/hr maximum)
Power Supply	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	90 VAC to 264 VAC, auto-ranging

Current Rating	100-120/200-240 VAC 2.0/1.0 A

Table 82: SummitPx1 application switch specifications

Physical Dimensions	
	Height: 1.75 inches (4.44 cm) Width: 17.25 inches (43.82 cm) Depth: 21.49 inches (54.58 cm) Weight: 16.75 lbs (7.54 kg)
Safety	
Certifications and Standards	UL 60950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 No. 60950-00 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Interference/ Compatibility (EMI/EMC)	
Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	EN60068 to Extreme IEC68 schedule
Heat Dissipation	90.9 W maximum (310.37 BTU/hr maximum)
Power Supply	
AC Line Frequency	47 Hz to 63 Hz
Input Voltage Options	100 to 120 VAC and 200 to 240 VAC, auto-ranging
Current Rating	100-120/200-240 VAC 1.0/0.5 A

Table 83: Alpine 3800 series switch specifications

Physical Dimensions	
Alpine Switches	**Alpine 3808**
	Height: 21 inches (53.30 cm) Width: 17.32 inches (44 cm) Depth: 11.375 inches (28.90 cm) Weight, empty chassis: 50 pounds (22.7 kg) Weight, fully loaded chassis: 98 pounds (44.5 kg) Weight, each power supply: 14 pounds (6.4 kg) Weight, each module: 3 pounds (1.4 kg)

	Alpine 3804 Height: 10.5 inches (26.65 cm) Width: 17.32 inches (44 cm) Depth: 15.53 inches (39.42 cm) Weight, empty chassis: 30 pounds (13.6 kg) Weight, fully loaded chassis: 68 pounds (30.9 kg) Weight, each power supply: 14 pounds (6.4 kg) Weight, each module: 3 pounds (1.4 kg) **Alpine 3802** Height: 7 inches (17.78 cm) Width: 17.32 inches (44 cm) Depth: 12 inches (30.48 cm) Weight, empty chassis: 30 pounds (13.6 kg) Weight, fully loaded chassis: 40 pounds (18.1 kg) Weight, each module: 3 pounds (1.4 kg)
Safety	
Certifications and Standards	UL 1950 3rd Edition, listed Alpine 3802:UL 60950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 No. 60950-00 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Alpine 3802: IEC 60950:1999 3rd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Interference/ Compatibility (EMI/EMC)	
Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	EN60068 to Extreme IEC68 schedule
Telecommunications	NEBS/Telcordia, Type IV, Level 3, Issue2 EN/ETSI 300 386-2 v1.1.3 (1997) MIC Telecom
Heat Dissipation	**Alpine 3808** 1046 W maximum (3600 BTU/hr maximum) **Alpine 3804** 577 W maximum (2000 BTU/hr maximum) **Alpine 3802** 315 W maximum (1076 BTU/hr maximum)
Power Supplies	
Alpine 3808	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	90 VAC to 264 VAC, auto-ranging

Current Rating	100-120 VAC 10 A 200-240 VAC 5 A -40 - -70 VDC 30 A
Alpine 3804	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	90 VAC to 264 VAC, auto-ranging
Current Rating	100-120 VAC 5.6 A 200-240 VAC 2.3 A -40 - -70 VDC 16.5 A
Alpine 3802	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	90 VAC to 264 VAC, auto-ranging
Current Rating	100-120 VAC 3.1 A 200-240 VAC 1.3 A -40 - -70 VDC 7.5 A max (-48 VDC 6.5 A)
Switch Power-Off	
Temperature power-off	Martek supplies: 75° C (167° F)

Table 84: BlackDiamond 6800 series switch specifications

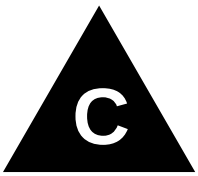
Physical Dimensions	
BlackDiamond Switches	**BlackDiamond 6816** Height: 61.25 inches (155.6 cm) Width, without rack mount ears: 17.50 inches (44.5 cm) Width, with rack mount ears: 19 inches (48.3 cm) Depth: 19.10 inches (48.51 cm) Weight, empty chassis: 140 lbs (63.5 kg) Weight, fully loaded chassis: 360 lbs (163.3 kg) Weight, each power supply: 30 to 33 lbs (13.6 to 15.0 kg) Weight, each module: 5 lbs (2.3 kg) **BlackDiamond 6808** Height: 26.25 inches (66.7 cm) Width: 17.32 inches (44 cm) Depth: 18 inches (45.7 cm) Weight, empty chassis: 60 lbs (27.2 kg) Weight, fully loaded chassis: 170 lbs (77.1 kg) Weight, each power supply: 30 to 33 lbs (13.6 to 15.0 kg) Weight, each module: 5 lbs (2.3 kg) **BlackDiamond 6804** Height: 19.25 inches (48.9 cm) Width: 17.32 inches (44 cm) Depth: 19 inches (48.26 cm) Weight, empty chassis: 57.5 lbs (26.1 kg) Weight, fully loaded chassis: 161 lbs (73 kg) Weight, each power supply: 30 to 33 lbs (13.6 to 15.0 kg) Weight, each module: 5 lbs (2.3 kg)
Safety	

Certifications and Standards	UL 60950 3rd Edition, listed cUL listed to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:2000 3rd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Interference/ Compatibility (EMI/EMC)	
Certifications and Standards	FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	EN60068 to Extreme IEC68 schedule
Telecommunications	NEBS/Telcordia, Type IV, Level 3, Issue2 EN/ETSI 300 386-2 v1.1.3 (2000) MIC Telecom
Heat Dissipation	**220 VAC Power Supply** 2544 W maximum (8687 BTU/hr maximum) **110 VAC Power Supply** 2661 W maximum (9088 BTU/hr maximum) **-48 DC Power Supply** 2708 W maximum (9246 BTU/hr maximum)
Power Supplies	
220 VAC Power Supply	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	200 VAC to 240 VAC, auto ranging
Current Rating	200 VAC 15 A
Weight	33.0 lbs (15.0 kg)
110 VAC Power Supply	
AC Line Frequency	50 Hz to 60 Hz
Input Voltage Options	100 VAC to 240 VAC, auto ranging
Current Rating	100/200 VAC 15/7.5 A
Weight	33.0 lbs (15.0 kg)
-48 DC Power Supply	
Input Voltage Options	-42 VDC to -70 VDC, auto ranging
Current Rating	-48 VDC 60 A
Weight	31.75 lbs (14.4 kg)
Switch Power-Off	

Temperature power-off	Original supply, not DC and not high-output: 75° C (167° F) DC Supply: Stand-alone: 65° to 70° C (149° to 158° F) In chassis: 70° C (158° F) High-output: 75° C (167° F)

Table 85: Common switch specifications

Environmental Requirements	
Operating Temperature	0° to 40° C (32° to 104° F)
Storage Temperature	-40° to 70° C (-40° to 158° F) -10° to 70° C (14° to 158° F) (Alpine 3802 only)
Operating Humidity	10% to 95% relative humidity, noncondensing
Certification Marks	
CE	CE (European Community)
TÜV Rheinland GS geprüfte Sicherheit	TUV/GS (German Notified Body)
TÜV Rheinland Argentina S.A.	TUV/S (Argentina)
GOST	GOST (Russian Federation)
ACN 090 029 066	C-Tick (Australian Communication Authority)
I.T.E. c UL us LISTED	Underwriters Laboratories (USA and Canada)
MIC	MIC (South Korea)
[redacted]	BSMI, Republic of Taiwan
NOM NYCE	NOM (Mexican Official Normalization, Electronic Certification and Normalization)



Module Technical Specifications

This appendix describes the technical specifications for both the Alpine and the BlackDiamond modules.

Alpine modules:

- SMMi module specifications on page 308
- GM-4Ti, GM-4Xi, and GM-4Si module specifications on page 308
- GM-WDMi module specifications on page 309
- FM-32Ti and FM-24Ti module specifications on page 310
- FM-24SFi and FM-24MFi module specifications on page 311
- FM-8Vi module specifications on page 311
- WM-4T1i and WM-4E1i module specifications on page 312
- WM-1T3i module specifications on page 313

BlackDiamond modules:

- MSM64i module specifications on page 314
- G8Xi, G8Ti, and G12SXi module specifications on page 314
- WDMi module specifications on page 315
- 10GLRi module specifications on page 316
- F48Ti and F96Ti module specifications on page 317
- F32Fi module specifications on page 318
- PoS module specifications on page 319
- ARM module specifications on page 320
- MPLS module specifications on page 320
- ATM module specifications on page 321

Specifications common to all modules:

- Common Module Specifications on page 322

The technical specifications for the Alpine modules are listed in Table 86 through Table 93. The technical specifications for the BlackDiamond modules are listed in Table 94 through Table 104. Specifications common to all modules are listed in Table 105.

Alpine Modules

Table 86: SMMi module specifications

Physical Dimensions	
	Height: 1.0 inches (2.5 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 4 lbs (1.8 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

Table 87: GM-4Ti, GM-4Xi, and GM-4Si module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 4 lbs (1.8 kg)
Safety	

Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

Table 88: GM-WDMi module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 4 lbs (1.8 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	

Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

Table 89: FM-32Ti and FM-24Ti module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 4 lbs (1.8 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

Table 90: FM-24SFi and FM-24MFi module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 4 lbs (1.8 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

Table 91: FM-8Vi module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 5 lbs (2.7 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH

Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

Table 92: WM-4T1i and WM-4E1i module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 5 lbs (2.7 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan) Low Voltage Directive (LVD)

Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997) T1: FCC CFR 47 Part 68 T1: CAN/CS-03 (Canada) T1: JATA Green Book (Japan) E1: CTR 12/13 (Europe)

Table 93: WM-1T3i module specifications

Physical Dimensions	
	Height: 1.5 inches (3.8 cm) Width: 16.25 inches (41.3 cm) Depth: 8.0 inches (20.3 cm) Weight: 5 lbs (2.7 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 1950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 950 EN60950:1992 A1-A4, A11:1996 plus deviations IEC950CB, IEC 60950:1991 A1-A4:1996 2nd Edition Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (1997)

BlackDiamond Modules

Table 94: MSM64i module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 6.25 lbs (2.81 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 95: G8Xi, G8Ti, and G12SXi module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 6.25 lbs (2.81 kg)
Safety	

Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 96: WDMi module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 6.25 lbs (2.81 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	

Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 97: 10GLRi module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 6.25 lbs (2.81 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 98 describes the immunity standards for the 10GLRi module.

Table 98: Immunity standards for the 10GLRi module

Test	Standard	Test Specification (CE required)	Performance Criterion (CE required)	Test Specification	Performance Criterion
Immunity to electrostatic discharge	EN 61000-4-2	±8kV air discharge, ±4kV contact discharge	B	±15kV air discharge, ±8kV contact discharge	B
Immunity to radiated RF electric fields	EN 61000-4-3	80-1000 MHz, 3V/m, 80% AM (1kHz)	A	80-1000 MHz, 10V/m, 80% AM Modulation (1kHz)	A
Immunity to fast transients	EN 61000-4-4	Data lines: ±0.5kV Power lines: ±1kV	B	-	B
Immunity to power surges	EN 61000-4-5	±1kV line to line, ±2kV line to earth	B	-	A
Immunity to RF common mode	EN 61000-4-6	150kHz-80MHz 3V RMS 80% AM (1kHz)	A	-	A
Power-frequency magnetic field	EN 61000-4-8	50Hz, 1A/m RMS	A	-	A
Mains voltage dips	EN 61000-4-11	30% reduction for 10mS	B	-	A
		60% reduction for 100mS	C	-	B
Voltage interruptions	EN 61000-4-11	>95% for 5000mS	C	-	B
Immunity to radiated RF field. Keyed carrier	ENV 50204	900MHz±5MHz 3V/m, 50% duty cycle, 200Hz replicating frequency	A	-	A

Performance criteria follows:

- A—Unit continues to function with maximum of 10% traffic loss, 10% CRC errors during the application of interference and recovers without operator intervention.
- B—Unit continues to function after the test without operator intervention.
- C—Temporary loss of function is permitted, provided the function is self-recoverable or can be recovered by the operation of controls

Table 99: F48Ti and F96Ti module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 6.25 lbs (2.81 kg)
Safety	

Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 100: F32Fi module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 5.0 lbs (2.27 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	

Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 101: PoS module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 5.25 lbs (2.38 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 102: ARM module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 5.25 lbs (2.38 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 103: MPLS module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 5.25 lbs (2.38 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH

Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019
Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Table 104: ATM module specifications

Physical Dimensions	
	Height: 1.6 inches (4.1 cm) Width: 15.1 inches (38.4 cm) Depth: 16.0 inches (40.6 cm) Weight: 5.25 lbs (2.38 kg)
Safety	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 UL 60950 3rd Edition, listed accessory cUL listed accessory to CAN/CSA-C22.2 No. 60950-00 EN60950:2000 plus deviations IEC950CB, IEC 60950:1999 Low Voltage Directive (LVD) AS/NZS 3260 S-Mark (Argentina) EN60825-1 + A11:1996 FCC CFR 21, CDRH
Electromagnetic Compatibility (EMC)	
Certifications and Standards	NEBS/Telcordia, Type IV, Level 3, GR-1089 Issue2 FCC CFR 47 Part 15 Class A CAN/ICES-003 Class A 89/336/EEC EMC Directive EN55022:1998 Class A CISPR22:1997 Class A EN55024:1998 includes IEC 6100-4-2, 3, 4, 5, 6, 11 EN6100-3-2, 3-3 VCCI Class A (Japan) AS/NZS 3548 (Australia/New Zealand) NOM/NYCE (Mexico) MIC Mark (Korea) GOST (Russia) CNS 13438 Class A (Taiwan)
Environmental	NEBS/Telcordia, Type IV, Level 3, GR-63 Issue2 EN/ETSI 300 019

Telecommunications	NEBS/Telcordia, Type IV, Level 3, GR-1089, GR-63 EN/ETSI 300 386-2 v1.1.3 (2000)

Common Module Specifications

Table 105 describes the specifications common to all modules.

Table 105: Common module specifications

Environmental Requirements	
Operating Temperature	0° to 40° C (32° to 104° F)
Storage Temperature	-40° to 70° C (-40° to 158° F)
Operating Humidity	10% to 95% relative humidity, noncondensing

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